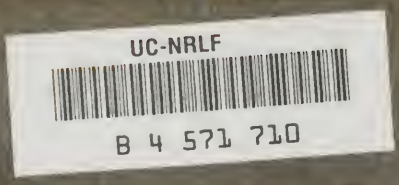

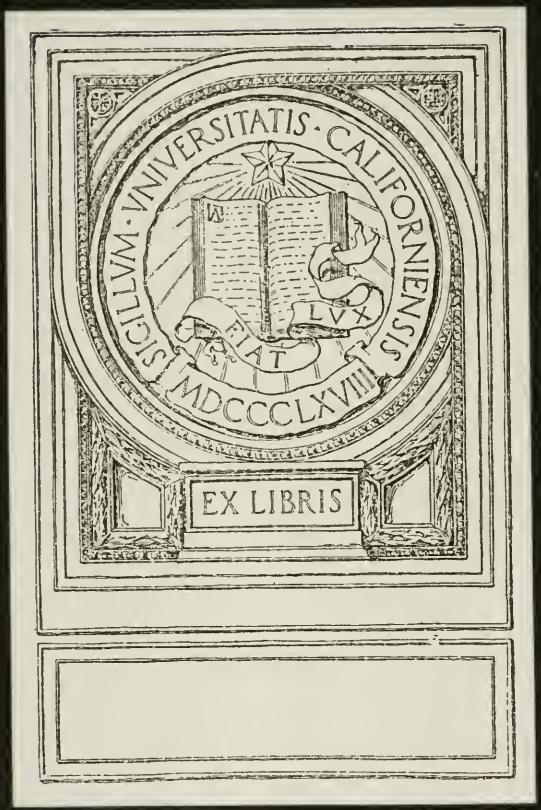
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CHAPTER XII

THE MORTALITIES OF INFANCY

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Infant Mortality. A Symptom-complex.—Infant mortality is a symptom-complex whose diverse factors—hereditary, congenital and environmental—when judiciously balanced and evaluated present a composite picture of community life of absorbing interest and practical socio-medical value. The mortalities of infancy traced to their finer ramifications reveal not only the sanitary status of a community but its social, economic and moral aspects as well. By a respectable, and ever enlarging, group of public health workers interested in child hygiene the infant mortality rate has come to be regarded as the most sensitive index we have of social and sanitary progress. Thus, Sir Arthur Newsholme speaking out of his wealth of experience states that "infant mortality is the most sensitive index we possess of social welfare and of sanitary administration, especially under urban conditions."*

The study and prevention of infant mortality has commanded the attention of philanthropic individuals and health authorities for some time, but its greatest popular impetus has come since the opening of the twentieth century. The social significance of infant mortality was early recognized. In his preface to "Infant Mortality—A Social Problem," Sir George Newman says "it cannot be too distinctly recognized, as Sir John Simon pointed out, that a high infant mortality rate almost necessarily denotes a prevalence of those causes and conditions which in the long run determine a degeneration of race; and further, that a high death-rate of infants is an indication of the existence of evil conditions in the homes of the people—which are, after all, the vitals of the nation."† Growing out of careful and extensive studies, fortified by the accumulated experience of many communities where intensive child hygiene work has been carried on, there has come the conviction that infant mortality can, and should be, largely prevented. No longer can "man's inhumanity to man," as exemplified too often by his neglect and cruelty to children, be condoned by the antiquated notion that "God sets the infant mortality rate." The causes of infant morbidity and mortality are largely preventable and man himself can do much if he will to mitigate or prevent them.

* Local Government Board of England and Wales, Thirty-ninth Annual Report, 1909–1910, Supplement to the Report of the Board's Medical Officer, Report on Infant and Child Mortality (Cd. 5263), p. 74.

† Newman, Sir George, Infant Mortality—A Social Problem, Preface, p. v., E. P. Dutton and Co., New York City (1907).

The Eugenic Argument.—There are on the other hand a skeptical group, largely followers of the Karl Pearson School of Biometrics, who join hands with certain of the Eugenists in urging that "Nature, not nurture" is the determining factor in infant mortality. They confidently state that on the whole a reduction of infant mortality is not an unmixed benefit to society, but tends to obstruct Nature in her struggle for existence by perpetuating the "weaklings" and "unfit." Popenoe and Johnson put it coldly when they say that "part of the children born in any district in a given year are doomed by heredity to an early death; that if they die in one year they will not be alive to die in the succeeding year and *vice versa*."* To this school of thought it is evident that further reduction of infant mortality is problematic and questionable as to eugenic results.†

The argument for this group of workers has been summed up by Popenoe and Johnson as follows: "We admit that it is possible to keep a lot of children alive who would otherwise have died in the first few months of life. It is being done, as the New York figures, and pages of others that could be cited, prove. The ultimate result is twofold: some of those who are doomed by heredity to a selective death, but are kept alive through the first year, die in the second or third or fourth year. They must die sooner or later; they have not inherited sufficient resistance to survive more than a limited time. If they are by great effort carried through the first year, it is only to die in the next. This is a statement which we have nowhere observed in the propaganda of the infant mortality movement; and it is perhaps a disconcerting one. It can only be proved by refined statistical methods, but several independent determinations by the English biometricians leave no doubt as to the fact."‡ The work of Karl Pearson, E. C. Snow and Ethel M. Elderton is cited to substantiate this statement. "There is still another consequence," they continue. "If the gain is by great exertions made more than temporary; if the baby who would otherwise have died in the first months is brought to adult life and reproduction, it means in many cases the dissemination of another strain of weak heredity, which natural selection would have cut off ruthlessly in the interests of race betterment. In so far, then, as the infant mortality movement is not futile it is, from a strict biological viewpoint, often detrimental to the future of the race."§

Influence of Infant Mortality on Mortality at Higher Ages.—These and similar arguments have been challenged and, in the opinion of the writer, amply answered by those who have had not only the special statistical training but also actual practical administrative experience

* Applied Eugenics by Popenoe, Paul and Johnson, Roswell Hill, p. 413. The Macmillan Company, New York (1918).

† *Ibid.*, pp. 414–417, also, Greenwood, M. and Brown, J. W., An Examination of Some Factors Influencing the Rate of Infant Mortality, Jour. Hyg., xii (1912), pp. 5–45, also, Pearson, Prof. Karl and Elderton, Miss Ethel M., The Relative Strength of Nurture and Nature, 2d Edit. London (1915).

‡ Applied Eugenics by Popenoe, Paul and Johnson, Roswell Hill, p. 413.

§ *Ibid.*, p. 414.

in the reduction of infant mortality. The eminent public health authority, Sir Arthur Newsholme, has shown in a series of classical reports to the Local Government Board of England that "a high infant death-rate in a given community implies in general a high death-rate in the next four years of life, while low death-rates at both age periods are similarly associated." In other words there is a "very high correlation between the amount of infant mortality and of mortality at ages one to five."*

Sir Arthur is very firm in his conviction that "there need therefore be no hesitation in making every practicable effort to reduce infant mortality. It is not only in accord with the highest feelings of humanity, but action which secures reduction of infant mortality also secures reduction of mortality at higher ages."† Holt, who has been intimately associated with the child hygiene movement in the United States since its beginning, is equally convinced that "a high infant mortality is in no sense a protection to our body politic. We must eliminate the unfit by *birth*, not by death. The race is to be most effectively improved by preventing marriage and reproduction by the unfit, among whom we would class the diseased, the degenerate, the defective and the criminal. In working for the survival of the feeble and the unfortunate we are not contravening nature's law and striving to save the unfit. A high infant mortality results in a sacrifice of the *unfortunate*, not the *unfit*."‡

No large community in the United States has shown more clearly what could be accomplished by intensive and well directed child hygiene work in reducing infant mortality than has New York City. The average infant mortality rate during the years 1911–1915 was 102. In 1917 the rate had dropped to 88.8, in 1919 it was 81.6 and in 1921 71.0. In commenting upon this before the Senate Committee considering the "Sheppard-Towner Bill for the Public Protection of Maternity and Infancy," Dr. S. Josephine Baker, Chief of the Bureau of Child Hygiene of New York City, said, "One of the great objections that has been raised against any intensive child welfare work has been that it perpetuates the unfit. In order to meet this objection we have kept rather careful statistics in New York City with regard to the child after it has passed the age of one year. Five years after we began our work with babies we began to watch the effect upon the mortality of children under five years of age. We have found since that time that the mortality in this age group—under five years—has shown a decline that has been much greater than that in the group under one year of age. In other words, the children are not only alive and well at the

* Local Government Board of England and Wales, 39th Annual Report, 1909–10 (Cd. 5263), p. 13.

† *Ibid.*, p. 17.

‡ Holt, L. Emmett, Infant Mortality, Ancient and Modern; An Historical Sketch. Presidential Address at the Fourth Annual Meeting of the American Association for the Study and Prevention of Infant Mortality. Transactions of the A. A. S. P. I. M. (1913), p. 25.

end of their first year, but they continue in good health throughout child life."*

TABLE 1.—SHOWING THAT THE EFFECT OF IMPROVED CARE DURING INFANCY IS NOTICEABLE ALSO IN AN INCREASED RESISTANCE TO DISEASE DURING CHILDHOOD

Based on figures from the New York City Bureau of Child Hygiene, 1904–1919. Baker, S. Josephine, The Bureau of Child Hygiene, New York City Department of Health, 3d ed., N. Y., 1915, Monograph series No. 4 and information from the Bureau of Child Hygiene in 1920 compiled by Ernst Christopher Meyer, in Infant Mortality in New York City, Publication No. 10 of the Rockefeller Foundation, International Health Board, New York City (1921), p. 128, Table III.

(*Death-rates per* 1000 *Living Children in New York City*)

Year	Under one year	Between		Under five years
		One and two years	Two and five years	
1904	164.0	56.9	17.9	58.5
1905	163.0	47.2	14.7	54.9
1906	164.0	50.0	14.8	56.2
1907	160.0	46.1	14.2	54.9
1908	144.0	41.9	13.1	50.0
1909	137.0	45.3	13.1	49.5
1910	134.0	40.1	12.2	47.7
1911	120.0	34.4	10.5	42.1
1912	110.0	31.1	9.4	38.3
1913	102.0	30.5	9.5	36.4
1914	94.6	29.8	9.2	32.9
1915	98.2	29.1	8.9	
1916	93.1	28.3	10.9	
1917	88.8	23.9	7.8	
1918	91.7	32.8	11.8	
1919	81.6	....	6.9	
Average Rate for Five-year Periods				
1904–08 incl	159.0	48.4	15.0	54.9
1909–13 incl	120.0	36.3	10.9	42.8
1914–18 incl	93.2	28.4	9.7	
Decrease per cent. 1904–1913	24.5	25.0	27.0	22.0
Decrease per cent. 1914–1918	22.3	21.7	11.0	

NOTE.—1914–1919 rates under one year of age based on reported births; all other rates based on estimated population.

In our enthusiasm concerning the reduction of infant mortality during recent years, we should not overlook the important fact that

* Hearing before the Committee on Public Health and National Quarantine, United States Senate, Sixty-sixth Congress, Second Session, Senate Bill 3259 for the Public Protection of Maternity and Infancy, p. 49. Washington, D. C., 1920.

many of the untoward conditions which determine a high infant mortality are also prejudicial to life at all ages, although acting with greater force in the earlier years. The considerable reduction in infant mortality has undoubtedly reflected improvements in general sanitary measures and better social and economic conditions, as well as a gradually increasing intelligence on the part of mothers regarding infant hygiene. Any specific measures for the reduction of infant mortality must always be balanced with all these other factors. Infant hygiene cannot be set upon a pedestal by itself but must be integrated with all other efforts for child welfare in the community.

Infant Mortality and Damage Rates among Survivors.—There is another aspect of the problem which should be carefully considered. By throwing all possible safeguards about the pregnant mother and by applying well tested methods of prenatal care and infant hygiene we not merely save the life of the child throughout the first year, but may prevent the development of many conditions which leave more or less serious defects. There is no question that a high infant mortality goes apace with a high damage rate among those who survive. While the mortality rate in the years succeeding infancy is comparatively low, the damage rate is very high. We are just beginning to appreciate the supreme importance of the pre-school age in its bearing upon the future health of the child. In this period arise many of the defects from which the child later suffers. Infant mortality, therefore, is not only an index of existing conditions; it is at once a reflection upon the past and a prophecy of the childhood of tomorrow. The initial casualites of war are long forgotten, or have become enshrined memories, while we are still caring for our *damaged* soldiers.

Influence of Infant Mortality on General Death-rate.—A careful analysis of the vital statistics of those countries where complete and reliable returns have been compiled reveals that the reduction of infant mortality has been one of the prime factors in lessening the general death-rate. At the present time a substantial reduction in the general death-rate rests largely in still further cutting down infant mortality, especially in the early weeks of life. In England and Wales from 1841 to 1870 inclusive the annual standardized death-rates at all ages ranged from 20.6 to 22.4 per 1000 living, and the infant mortality rates from 148 to 160 deaths under one year per 1000 live births. Very little change in a downward trend is noted either in the general mortality or in the infant mortality rates. About 1870 a distinct reduction in the general death-rate began which, with yearly fluctuations, has kept declining ever since, reaching the remarkably low rate of 12.4 in 1920. Infant mortality did not begin to show a marked reduction until some years later and not until after 1910 did the precipitate drop occur which reached 89 deaths under one year of age per 1,000 live births in 1919* and the surprising figure of 80 in 1920.

* Eighty-second Annual Report of the Registrar General of Births, Deaths and Marriages in England and Wales (1919), Table 8, p. 9 (cmd. 1017), London (1920).

It is reasonable to infer that general sanitary improvements in England after 1870 first began to be reflected in the general mortality rates, but had very little if any influence upon the infant mortality rates until intensive efforts for child hygiene had been put forth. When community organization and direct measures for the preven-

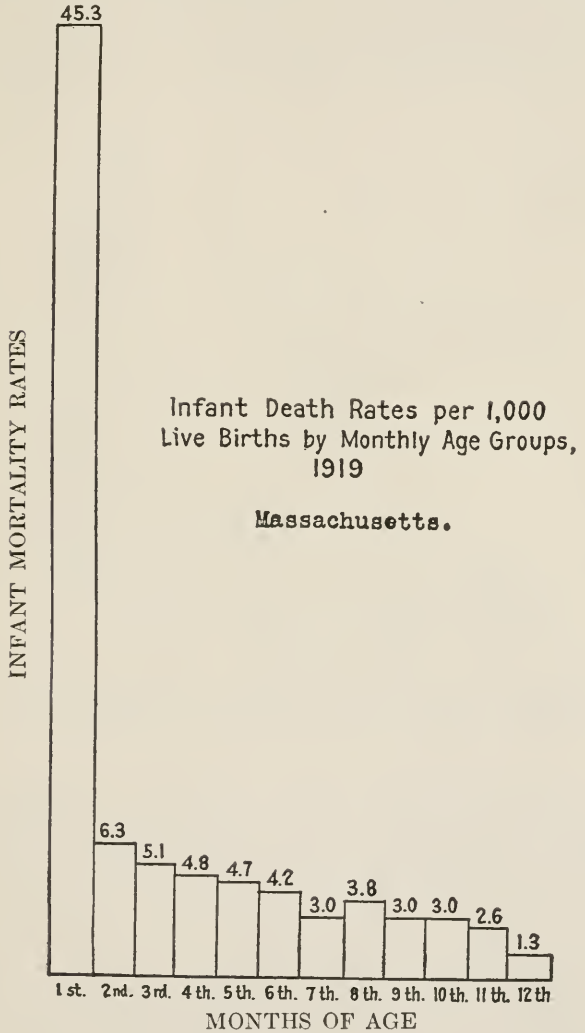


FIG. 1.—From the report of a special commission to investigate maternity benefits. Boston, Massachusetts, December, 1920. House Report No. 1835, p. 55.

tion of infant mortality, largely initiated by voluntary societies, came under government sanction and support, considerable impetus was given to child hygiene work. This has had a decided cumulative effect in still further reducing the general mortality.

The same tendency has been noted in the United States and other countries where intensive campaigns for the reduction of infant mortality have stimulated local authorities to study their problems and devise suitable means of solving them.

Gain and Loss in Infant Lives.—The reduction in the mortalities of infancy thus far effected has taken place largely in the latter half of the first year of life. Very little, if any, progress has been made in limiting deaths in the neonatal period. Upward of 40 per cent. of the

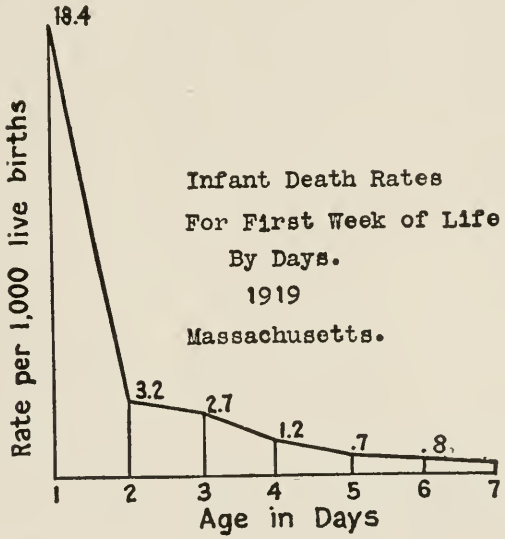


Fig. 2.—From the report of a special commission to investigate maternity benefits. Boston, Massachusetts, 1920. House Report No. 1835, p. 54.

deaths during the first year of life occur in the first month. In Massachusetts during 1919 the infant mortality rate was 88.2. Over 50 per cent. of these deaths (or 45.3 per 1000 live births) occurred before the babies had reached one month of age. On a conservative basis 40 per cent. of the neonatal deaths could have been prevented by proper prenatal and obstetrical care. Figures 1 and 2 show graphically the age distribution of deaths under one year in Massachusetts during 1919. Note particularly the high mortality in the first month and in the first few days of life. These charts are typical of what might be shown for other localities throughout the United States.

Maternal Mortality.—A shockingly large number of mothers are still sacrificed each year. The rates in the United States are uniformly higher than in a number of foreign countries. The maternal mortality rate has been gradually advancing in recent years. It is estimated that an increase of 15 per cent. took place in the first six months of

1920 as compared with 1919.* Hand in hand with this, the number of abortions and still births remains abnormally high.

TABLE 2.—MATERNAL MORTALITY RATES IN CERTAIN FOREIGN COUNTRIES COMPARED WITH THE UNITED STATES BIRTH REGISTRATION AREA PER 1000 BIRTHS

Rates from the latest available official reports up to 1919
Compiled by Robert M. Woodbury, Statistician, U. S. Children's Bureau, Washington, D. C.

Australia (1918)	4.7
England and Wales (1919)	4.4
Finland (1916)	3.6
France (1913)	4.6
Hungary (1915)	4.0
Ireland (1918)	4.8
Italy (1915)	2.2
Japan (1916)	3.5
New Zealand (1919)	5.1
Norway (1915)	2.7
Prussia (1914)	3.5
Scotland (1919)	6.2
Spain (1915)	5.2
Sweden (1915)	2.9
Switzerland (1915)	5.5
The Netherlands (1919)	3.4
United States (Birth Registration Area, 1919)	7.4

MATERNAL MORTALITY RATES, 1915–1920. U. S. BIRTH REGISTRATION AREA

Year	Deaths from puerperal causes per 1000 live births		
	All puerperal causes	Puerperal septicemia	All other puerperal causes
1915	6.1	2.4	3.7
1916	6.2	2.5	3.7
1917	6.6	2.7	3.9
1918	9.2	2.6	6.6
1919	7.4	2.5	4.9
1920	8.0	2.7	5.3

While it is true that sanitation and infant hygiene have had a marked effect in reducing infant mortality in the sixth, seventh and eighth months of life they have not made a dent upon the birth mortalities, nor influenced perceptibly the miscarriages and still births. It is clear that prenatal and neonatal causes of death may continue to act throughout the first year of life and, although they rapidly decrease in intensity during the following four years, their influence may still be noted at later periods. *Apropos* of this, Sir Arthur

* Statistical Bulletin, Metropolitan Life Insurance Co., Louis I. Dublin, Statistician, vol. i, No. 2 (Nov., 1920), p. 8.

Newsholme has pointed out the "immense national importance of reduction of infant mortality," even in the earliest months, "for an excessive infant mortality is nearly always associated with an excessive death-rate during the next four years of life, and communities showing excessive death-rates in the first five years of life suffer to a greater or less extent from excessive death-rates right up to adult life. Conversely, low infant mortalities are associated in the same communities with low death-rates at subsequent ages up to adult life; and there can be little doubt that if the influence of migration of population could be eliminated, the effect of conditions influencing health during the early years of life would be found to persist throughout adult life. Nor are these effects restricted to deaths. All evidence points to the conclusion that the general standard of health is higher in districts having a low mortality in early life."* In order to show the interrelation of some of these factors a table is inserted giving the English experience over a series of years.

ENGLAND AND WALES

TABLE 3.—Compiled by Dr. Janet M. Campbell, Senior Medical Officer for Maternity and Child Welfare, Ministry of Health, and presented in an address on "Maternity Homes" before the Second English Speaking Conference on Infant Welfare, London, July, 1921.

Year	Birth-rate	Death-rate	Infant mortality rate	Maternal mortality (Classification as in use before 1911)			
				No. of deaths	Deaths per 1000 births		
					Sepsis	Other causes	Total childbirth
1905	27.3	15.3	128	3905	1.87	2.33	4.20
1906	27.2	15.5	132	3757	1.75	2.27	4.02
1907	26.5	15.1	118	3520	1.60	2.23	3.83
1908	26.7	14.8	120	3361	1.48	2.09	3.57
1909	25.8	14.6	109	3379	1.56	2.14	3.70
1910	25.1	13.5	105	3191	1.42	2.14	3.56
1911	24.3	14.6	130	3236	1.52	2.15	3.67
1912	23.9	13.3	95	3299	1.47	2.31	3.78
1913	24.1	13.8	108	3271	1.34	2.37	3.71
1914	23.8	14.0	105	3469	1.63	2.32	3.95
1915	21.9	15.7	110	3210	1.56	2.38	3.94
1916	20.9	14.4	91	3038	1.47	2.40	3.87
1917	17.8	14.4	96	2446	1.39	2.27	3.66
1918	17.7	17.6	97	2353	1.35	2.20	3.55
1919	18.5	13.8	89	2852	1.76	2.36	4.12
1920	25.4	12.4	80	3942	1.87	2.25	4.12

* Local Government Board of England and Wales, 39th Annual Report, 1909–10 (Cd. 5263), p. 19.

The Appeal to the Medical Man.—To the medical man the problems of infant mortality make more than a professional appeal. In their study he is inevitably brought face to face with socio-economic forces which not only influence the life of his own community, but also affect the future of medicine itself. His social conscience is quickened and his humanitarian interests activated. The physician, whether a pediatrist or not, cannot escape the responsibility which faces him in a community where infant mortality remains unduly high. He above all others should be in a position to point out the various factors entering into the infant mortality problem and take definite steps to assist his community in gearing up their resources to bring about a substantial reduction.

The treatment and cure of the comparatively small number of ill babies which come under the surveillance of any one physician in his private practice year by year can influence but little the infant mortality rate. It is therefore unbecoming, as well as untenable, for any physician to take the position that organized child hygiene work in his community will seriously cut into his private practice. As a matter of fact, in those communities where infant hygiene work has been well conceived and carried out with the hearty coöperation of the medical profession it has proved satisfactory to physicians and mothers alike in making it possible to get the babies at a much earlier period so as to forestall their sickness, or institute treatment at a time when the best results can be obtained. The mothers themselves have soon learned the lesson to consult a physician early. It has also made it possible through trained public health nurses for the physician to secure assistance in carrying out the details of weighing and measuring the baby and of seeing that his directions are carefully followed in the home.

Variability of Infant Mortality.—The most outstanding feature of infant mortality is its variability. (See Table 4, showing infant mortality rates in various countries.) It exhibits marked geographical, racial, seasonal and social variations. The infant mortality rate varies markedly not only in different parts of the same country, but in neighboring cities and adjacent wards of the same city and in the same country in different years. The factors entering into it are so complex and interwoven that no one formula can be applied for its complete solution. Each factor must be weighed and studied in its proper relationship. Intensive methods of infant hygiene must be applied to reduce the mortality factor by factor until the lowest possible denominator, as it were, has been obtained.

General Classification of Causes of Infant Mortality.—

1. Congenital diseases. (Injuries at birth and diseases of early infancy are classed under a variety of indefinite terms, such as atrophy, marasmus, debility, etc.)
2. Gastro-intestinal diseases.
3. Respiratory diseases.
4. Acute infectious diseases of childhood.
5. Other causes.

FIG. 3.—Local variability of infant mortality in New Jersey.

TABLE 4.—SHOWING INFANT MORTALITY RATES IN VARIOUS FOREIGN COUNTRIES IN COMPARISON WITH THE BIRTH REGISTRATION AREA OF U. S. A.
By sex

Excerpts from Birth Statistics for the Birth Registration Area of the United States for 1919, Bureau of the Census, page 31.

Country	Year	Infant mortality rates (Deaths under one year per 1000 births)		
		Male	Female	Total
United States Registration Area	1919	95.8	77.0	86.6
Australian Commonwealth	1919	76.3	61.7	69.0
Ceylon	1919	227.8	217.3	222.5
Chile	1918	260.9	248.2	254.5
Denmark	1918	81.8	65.6	73.7
England and Wales	1919	100.0	77.6	89.0
France	1919	.....	.....	119.0
Germany* (excluding Alsace-Lorraine)	1918	167.0	140.0	154.0
Ireland	1918	95.7	76.6	86.1
Italy	1916	174.5	157.7	166.1
Jamaica	1919	167.7	155.4	161.5
Japan	1916	178.9	161.2	170.0
The Netherlands	1917	63.6	49.9	56.7
New Zealand	1918	53.6	43.0	48.3
Spain	1915	165.7	145.3	155.5
Sweden	1915	83.8	67.4	75.6
Switzerland	1918	96.9	79.1	88.0

* Delbrück, Stat. Reichsamt, Berlin.

Data supplied by Department of Vital Statistics, League of Red Cross Societies, Geneva, Knud Stuman, Statistician (1921).

The death-rates per 1000 estimated midyear population under one year from the important causes which make up this broad classification for the years 1910–1918 in the Registration Area for Deaths in the United States are given in Table 5. It is instructive to compare this table with Table 6 showing the per cent. of deaths from certain important causes to total deaths under one year of age in the Registration Area as of 1910 in the United States from 1910 to 1919 inclusive. Figure 4 shows graphically the infant death rates for the principal causes in Massachusetts for the year 1919.

The percentage of deaths under one year of age to total deaths in the United States has gradually decreased from 19.4 in 1910 to 14.4 in 1919. A study of the classified subdivisions of the first year of life for the period 1910–1919 reveals that there has been practically no decrease under one month (Table 7). The greatest decrease has occurred in the periods three to five months and six to eight months. A glance at Table 5 will make it clear that there has been a con-

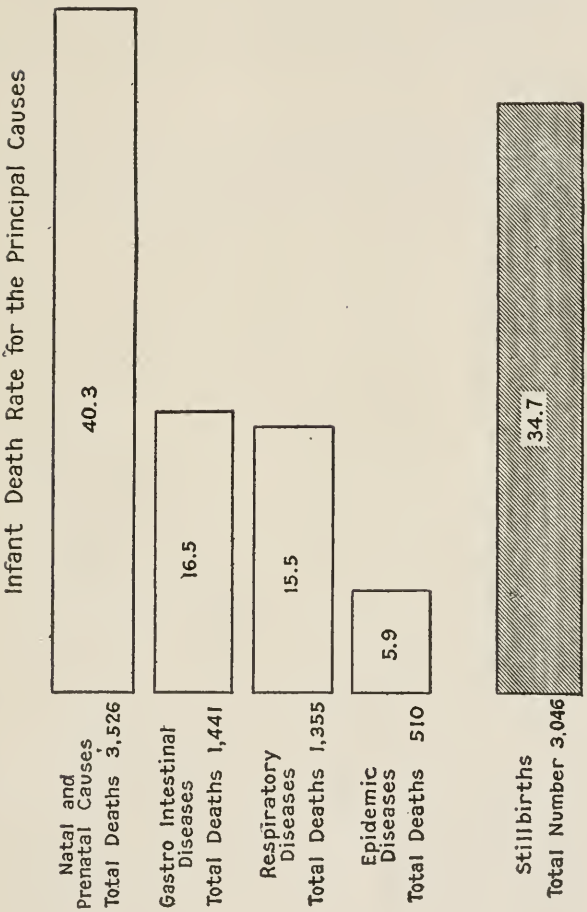


FIG. 4.—Massachusetts House Report 1920, No. 1835, p. 53.

siderable increase in deaths from "premature births," "malformations" and "injuries at birth" while the most marked *decrease* has occurred in "diarrhea and enteritis." The increase in "premature births" may be only apparent, however, on account of a transference in the cause of death.

TABLE 5.—DEATH-RATE PER 1000 ESTIMATED MIDYEAR POPULATION UNDER ONE YEAR OF AGE FROM CERTAIN IMPORTANT CAUSES IN THE REGISTRATION STATES AS OF 1910: (EXCLUSIVE OF NORTH CAROLINA) 1910 TO 1918

Abridged int. List No.	Cause of death	1918	1917	1916	1915	1914	1913	1912	1911	1910
	All causes under one year of age	110.7	102.9	105.4	103.4	108.7	116.0	112.2	116.0	131.7
5	Measles	1.1	1.1	1.4	0.7	0.7	1.5	0.9	1.0	1.3
6	Scarlet fever	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2	0.3
7	Whooping cough	3.3	2.3	2.5	2.1	2.4	2.5	1.3	2.8	3.0
8	Diphtheria and croup	0.4	0.5	0.5	0.5	0.6	0.5	0.5	0.6	0.8
9	Influenza	6.9	0.8	1.0	0.7	0.3	0.4	0.3	0.5	0.4
(12)	Dysentery	0.3	0.2	0.2	0.3	0.3	0.3	0.4	0.4	0.6
(12)	Erysipelas	0.5	0.6	0.6	0.5	0.5	0.6	0.6	0.6	0.6
(37)	Tetanus	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.2	0.2
13	Tuberculosis of the lungs	0.5	0.6	0.6	0.5	0.6	0.6	0.6	0.7	0.8
14	Tuberculous meningitis	0.8	0.8	0.8	0.9	0.8	0.9	0.9	1.0	0.9
15	Other forms of tuberculosis	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.4
(37)	Syphilis	1.1	1.3	1.4	1.3	1.3	1.3	1.3	1.3	1.3
17	Meningitis	0.9	0.9	0.8	1.0	1.1	1.2	1.3	1.6	2.0
(37)	Convulsions	1.2	1.1	1.3	1.7	2.2	2.5	2.7	3.0	3.6
19	Organic diseases of the heart	0.4	0.4	0.4	0.4	0.4	0.6	0.6	0.7	0.8
20	Acute bronchitis	2.5	2.7	2.4	2.5	2.6	2.9	3.1	3.0	3.7
22	Pneumonia	5.6	4.7	4.2	4.5	4.8	5.3	5.7	5.6	6.9
(23)	Bronchopneumonia	10.7	9.8	9.6	10.1	9.9	9.9	9.3	8.6	8.9
24	Diseases of the stomach	1.5	1.3	1.5	1.6	1.8	2.2	2.3	2.3	2.6
25	Diarrhea and enteritis	22.2	23.2	24.3	22.6	24.7	28.1	26.2	29.0	37.7
(33)	Malformations	7.5	7.5	7.5	6.9	7.3	6.8	6.5	6.4	6.6
(33)	Premature birth	22.1	21.1	21.2	20.3	20.1	20.0	19.1	18.4	17.5
(33, 37)	Congenital debility	10.1	9.4	10.3	11.9	13.4	15.5	15.0	14.6	13.2
(37)	Injuries at birth	3.9	4.6	4.4	4.3	4.2	3.9	3.7	3.7	3.2
35	External causes	1.1	1.4	1.2	1.1	1.2	1.3	1.2	1.5	1.3
38	Unknown or ill-defined diseases	1.1	1.1	1.0	0.9	1.0	1.0	1.1	1.1	5.8
	All other causes	1.6	5.2	6.0	5.5	5.6	5.7	6.0	6.7	7.2

From U. S. Mortality Statistics, 1918, p. 47, Nineteenth Annual Report Bureau of the Census, Washington, D. C., 1920.

TABLE 6.—PER CENT. OF DEATHS FROM CERTAIN IMPORTANT CAUSES TO TOTAL DEATHS UNDER ONE YEAR OF AGE IN THE REGISTRATION STATES AS OF 1910 (EXCLUSIVE OF NORTH CAROLINA): 1910 TO 1919

Cause of death	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910
All causes under one year of age..	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Measles.....	0.5	1.0	1.0	1.4	0.7	0.7	1.3	0.8	0.9	1.0
Scarlet fever.....	0.1	0.1	0.1	0.1	0.1	0.1	0.2	0.1	0.2	0.2
Whooping cough...	1.4	3.0	2.2	2.4	2.1	2.3	2 1	2.1	2.4	2.4
Diphtheria and croup.....	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.6
Influenza.....	4.0	6.3	0.8	0.9	0.6	0.3	0.4	0.3	0.4	0.3
Dysentery.....	0.2	0.2	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.5
Erysipelas.....	0.5	0.4	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5
Tetanus.....	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.2
Tuberculosis of the the lungs.....	0.5	0.5	0.6	0.5	0.5	0.5	0.5	0.6	0.6	0.6
Tuberculous meningitis.....	0.7	0.7	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.7
Other forms of tuberculosis.....	0.2	0.2	0.2	0.3	0.3	0.3	0.3	0.3	0.3	0.3
Syphilis.....	1.1	1.0	1.3	1.3	1.3	1.2	1.2	1.1	1.2	1.0
Meningitis.....	0.8	0.8	0.9	0.8	0.9	1.0	1.0	1.1	1.4	1.5
Convulsions.....	1.1	1.1	1.1	1.2	1.6	2.0	2.1	2.4	2.6	2.7
Organic diseases of the heart.....	0.4	0.3	0.4	0.3	0.4	0.4	0.5	0.6	0.6	0.6
*Acute bronchitis....	*2.5*	*2.3*	*2.6*	*2.3*	*2.4*	*2.4*	*2.5*	*2.7*	*2.6*	*2.8*
*Pneumonia.....	*3.7*	*5.1*	*4.6*	*4.0*	*4.4*	*4.5*	*4.5*	*5.0*	*4.8*	*5.3*
Bronchopneumonia	*9.8*	*9.6*	*9.5*	*9.1*	*9.8*	*9.1*	*8.5*	*8.3*	*7.4*	*6.8*
Diseases of the stomach.....	1.5	1.4	1.2	1.4	1.5	1.7	1.9	2.0	2.0	2.0
*Diarrhea and enteritis.....	*19.4*	*20.0*	*22.5*	*22.9*	*21.9*	*22.8*	*24.2*	*23.3*	*25.0*	*28,6*
Malformations.....	8.0	6.8	7.3	7.1	6.6	6.7	5.9	5.8	5.5	5.0
*Premature birth....	*21.8*	*20.0*	*20.5*	*20.1*	*19.6*	*18.5*	*17.2*	*17.0*	*15.8*	*13.3*
*Congenital debility..	*9.6*	*9.1*	*9.2*	*9.8*	*11.5*	*12.3*	*13.3*	*13.4*	*12.6*	*10.0*
*Injuries at birth....	*4.5*	*3.5*	*4.4*	*4.2*	*4.2*	*3.9*	*3.4*	*3.3*	*3.2*	*2 4*
External causes....	1.1	1.0	1.3	1.2	1.1	1.1	1.1	1.1	1.3	1.0
Unknown or ill-defined diseases..	1.1	1.0	1.0	1.0	0.9	0.9	0.9	0.9	1.0	4.4
All other causes....	4.8	4.2	5.1	5.7	5.4	5.2	4.9	5.4	5.8	5.5

U. S. Mortality Statistics, 1919. Twentieth Annual Report, Department of Commerce, Bureau of the Census, Washington, D. C., 1921, p. 54.

TABLE 7.—PER CENT. OF TOTAL DEATHS UNDER ONE YEAR OF AGE TO TOTAL DEATHS, AND IN EACH OF THE 12 SUBDIVISIONS OF THE FIRST YEAR OF LIFE TO DEATHS UNDER ONE YEAR OF AGE IN THE REGISTRATION STATES* AS OF 1910 (EXCLUSIVE OF NORTH CAROLINA): 1910 TO 1919

Age	1919	1918	1917	1916	1915	1914	1913	1912	1911	1910
Deaths under one year of age to total deaths...	14.4	13.0	15.7	16.1	16.6	17.3	17.9	17.7	17.9	19.4
Total deaths under one year of age.	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
Under 1 day.....	16.6	14.9	15.8	15.6	16.0	14.6	13.3	12.7	11.8	9.8
1 day.....	5.2	4.9	4.9	5.0	5.0	5.1	4.9	5.2	5.3	4.9
2 days.....	4.0	3.6	3.8	3.8	3.7	3.8	3.4	3.5	3.3	2.9
3 to 6 days.....	7.2	6.4	7.2	7.2	7.1	7.3	6.7	6.9	6.8	6.1
1 week.....	6.6	5.9	6.2	6.0	6.2	6.3	6.2	6.2	6.1	5.7
2 weeks.....	4.5	4.3	4.6	4.4	4.7	4.8	4.7	4.8	4.8	4.6
3 weeks but under 1 month.....	3.6	3.4	3.7	3.5	3.7	3.7	3.7	3.9	3.7	3.8
1 month.....	8.5	8.4	8.9	8.8	9.0	9.2	9.5	9.6	9.8	9.9
2 months.....	6.8	7.0	7.0	7.0	7.3	7.6	7.7	8.0	7.9	8.4
3 to 5 months.....	16.0	16.4	16.2	16.2	16.3	16.7	17.5	17.3	17.7	19.3
6 to 8 months.....	11.9	13.6	12.0	12.4	11.9	12.0	12.5	12.4	12.8	14.1
9 to 11 months....	9.1	11.3	9.7	10.1	9.1	9.1	9.9	9.6	9.9	10.7

* *Ibid.*, Table 6.

From the English statistics, which are much more complete and cover a wider range in time, we can draw more reliable conclusions. Table 8 shows the infant mortality in England and Wales during the period 1883–1919 with the *diarrheal diseases* segregated so that we may see at once the influence of them upon the total rate. It is clearly seen that during the latter years of the last century infant mortality increased somewhat as the result of a marked increase in diarrheal diseases, while there was practically no tendency for other diseases causing infant deaths to fall. From 1900 onward there has been a precipitate fall in infant mortality, more marked since 1910. The fall in the mortality from diarrheal diseases in this period has been paralleled by a drop in mortality from other causes. The yearly fluctuations in infant mortality are often traceable to exceptionally trying summers or sudden meteorological changes.

TABLE 8.—ENGLAND AND WALES: INFANT MORTALITY, 1883–1919

Year	Deaths under one year of age per 1000 births		
	Total	Diarrheal diseases	Total less diarrheal diseases
1883	137	12	125
1884	147	21	126
1885	138	11	127
1886	149	20	129
1887	145	18	127
1888	136	11	125
1889	144	16	128
1890	151	16	135
1891	149	13	136
1892	148	15	133
1893	159	28	131
1894	137	12	125
1895	161	28	133
1896	148	21	127
1897	156	31	125
1898	160	37	123
1899	163	40	123
1900	154	28	126
1901	151	32	119
1902	133	15	118
1903	132	18	114
1904	145	30	115
1905	128	21	107
1906	132	31	101
1907	118	13	105
1908	120	20	100
1909	109	13	96
1910	105	13	92
1911	130	36	94
1912	95	8	87
1913	108	19	89
1914	105	17	88
1915	110	15	95
1916	91	11	80
1917	96	10	86
1918	97	10	87
1919	89	9	80

Eighty-second Annual Report of the Registrar-General of Births, Deaths, and Marriages in England and Wales (1919), Table XXVI.

Contributing Factors.—While the tables give some idea of the principal causes of infant mortality they do not clearly indicate any of the *contributing factors*. These may be prenatal, natal or postnatal and due to purely local conditions or more general causes. To gain

some idea of the number and complexity of these conditions the most important of them are here listed with no attempt to show their relative importance or mutual relationships, intimate as these may be:

FACTORS INFLUENCING INFANT MORTALITY

Meteorological
- Variations in temperature
- Humidity
- Prevailing winds
- Dust storms
- Sunshine and fogs

Character of the Population
- Racial stamina and resistance
- General intelligence
- Habits and customs
- Age distribution
- Homogeneity
- Diversity of language
- Industrial welfare
- Stability of residence

Births
- Changes in completeness of birth registration and notification
- Marked decrease or increase in birth rate
- Relative number of first-born in any one year
- Proportion of male to female births
- Proportion of legitimate to illegitimate births
- Number of still births
- Magnitude of birth rate
- Attendants at birth

Nationality
- Manners and customs
- Prevalence of breast feeding
- Racial immunity
- Adaptability to new environment
- Whites *vs.* Negroes

Standards of Public Health and Hygiene
- Control of epidemics
- Milk and water supplies
- Character of prenatal and obstetric care
- Housing conditions
- Domestic and municipal sanitation.
- Fly and mosquito prevention
- Prevalence of vaccination against smallpox
- Training of physicians and nurses in infant welfare
- Provisions for treatment of syphilis and tuberculosis
- Methods of infant feeding
- Supervision of midwives
- Supervision of boarding homes

Pathologic Conditions
- Prenatal pathologic states
- Congenital defects
- Prematurity
- Syphilis
- Tuberculosis
- Alcoholism
- Prevalence of epidemics

Condition of Mother
- Poverty and bad social life
- Shiftlessness and ignorance
- Industrial employment
- Age at marriage
- Frequency of pregnancies
- Urban or rural life
- Industrial poisoning
- Malnutrition of mother
- Exhausting diseases

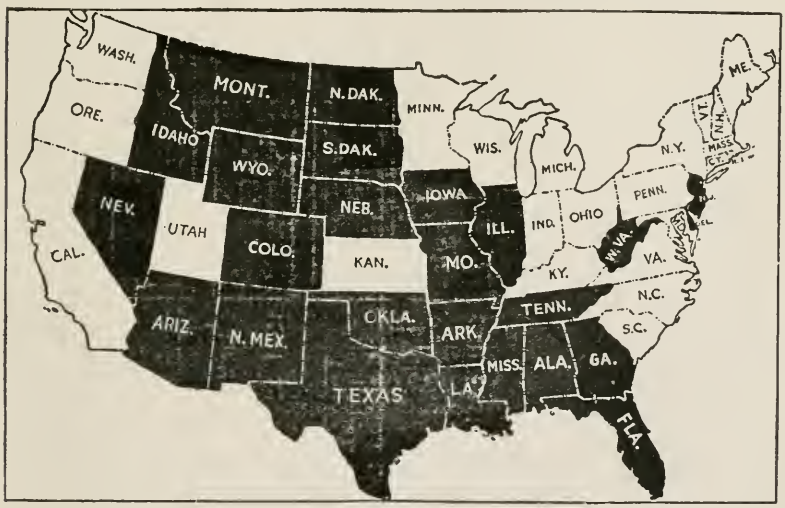
Social and Economic Condition
- Unemployment. Strikes
- Food shortage

Wars and Their Aftermath

Birth Registration.—It is readily seen that so many possible factors may enter into the problem of infant mortality that no sweeping statement can be made which will adequately cover it and focus our attention upon any panacea for its reduction. Before we can gain a full rounded picture of infant mortality in the United States we must have more complete and accurate vital statistics covering a larger part of the country. A satisfactory and conclusive study of the mortalities of infancy in the United States is impossible without accurate and fairly complete statistics. Birth registration is a *sine qua non* of an exact knowledge of infant mortality and of any practical methods for its reduction, *the rate of infant mortality being most con-*

veniently expressed as the number of deaths of infants under one year of age per 1000 *born alive during the year.* Unfortunately the United States lags far behind England and Wales and other European states in the completeness of its birth returns. The registration of births, deaths and marriages in England and Wales has been remarkably complete for many years, the registration of births and deaths being made compulsory in 1870. The Annual Reports of the Registrar-General of England and Wales are admirable studies in vital statistics. The Birth Registration Area of the United States, which was established by the Director of the Census in 1915, includes those states having satisfactory registration laws which, upon tests by the Bureau of the Census, Division of Vital Statistics, can show that at least 90 per cent. of their births are registered. In 1920, 23 states and the District of Columbia were in the Registration Area for Births. This area contains 58.4 per cent. of the population of the United States

(*Reprinted from August, 1920, Number of* MOTHER AND CHILD)



BIRTH REGISTRATION AREA IN WHITE, 1920

FIG. 5.—See report of the committee on vital and social statistics on registration of births in the United States. Trans. American Child Hygiene Assoc. Annual Meeting, 1920, pp. 231–232.

(Fig. 5). The registration of deaths is much more complete, the Registration Area for Deaths in 1919 including 33 states, the District of Columbia and 18 cities in non-registration states, the total having a population of 81.1 per cent. of the total estimated population of the United States. While the certification as to the *fact* of death in this country is quite complete, the *cause* assigned to many an infant death is too often misleading. It is unfortunate that no uniform method of registering still births is in force in this country, as a considerable amount of valuable information could be gained from a careful analysis

of the still births. The United States Bureau of the Census has only undertaken to compile the still birth statistics for the one year 1918. For a number of years the New York Milk Committee collected statistics on infant mortality and made them available each year before it was possible for the Census Bureau to compile its data. In 1912 the Committee issued a special report which contains a wealth of statistical data and other valuable material.* In this way excellent educational work was carried on which stimulated many communities to organize their resources for the reduction of infant mortality. During the past two years the American Child Hygiene Association has continued the statistical reports on infant mortality of the New York Milk Committee by collecting statistics on infant mortality in the United States and making them available as early as possible. In 1920 the American Child Hygiene Association published statistics covering 269 cities of over 10,000 population in the United States for 1919. In June, 1921, a statistical report of infant mortality for 1920 in 519 cities in the United States was published.† When complete and prompt birth notification and registration are carried on in all parts of the country we may expect to have decidedly lower infant mortality rates. We will then be in a position to trace from year to year precisely what is taking place in the mortalities of infancy.

The Trend of Infant Mortality in the United States.—The trend of infant mortality for the 519 cities included in the 1921 Report of the American Child Hygiene Association is shown according to population grouping in Table 9.

The figures for the entire 519 cities for the five years follow:

Table 9.—Infant Mortality Rates

Population	1916	1917	1918	1919	1920
Over 250,000	97.9	95.0	102.9	86.9	88.9
100,000–250,000	107.0	104.0	116.1	92.8	94.1
50,000–100,000	103.0	100.3	105.5	89.7	93.9
25,000–50,000	103.1	95.2	106.3	88.2	87.5
10,000–25,000	105.3	100.7	113.0	93.9	91.6
All cities in Area	101.1	98.1	106.8	89.0	90.5

It is seen that a distinct gain in the saving of infant life has been made even in the last five years, and this is more marked if we carry our observations back over a 10-year period. One of the most interesting and hopeful signs is that the smaller cities are showing each year a relatively greater reduction than the larger centers of population. This indicates on the whole that the smaller towns are beginning to learn the lessons which were being taught in the larger cities during the preceding years. This "catching up" is well shown in Fig. 6

* Infant Mortality and Milk Stations. Special Report of the New York Milk Committee on the Reduction of Infant Mortality, edited by Philip Van Ingen and Paul Emmons Taylor. New York City (1912).

† Statistical Report of Infant Mortality for 1920 in 519 Cities of the United States. Compiled by Philip Van Ingen for the American Child Hygiene Association, 1211 Cathedral Street, Baltimore, Md. (1921).

giving the infant mortality rates monthly from 1913 to 1919 for New York City, New York State and for parts of the state outside New

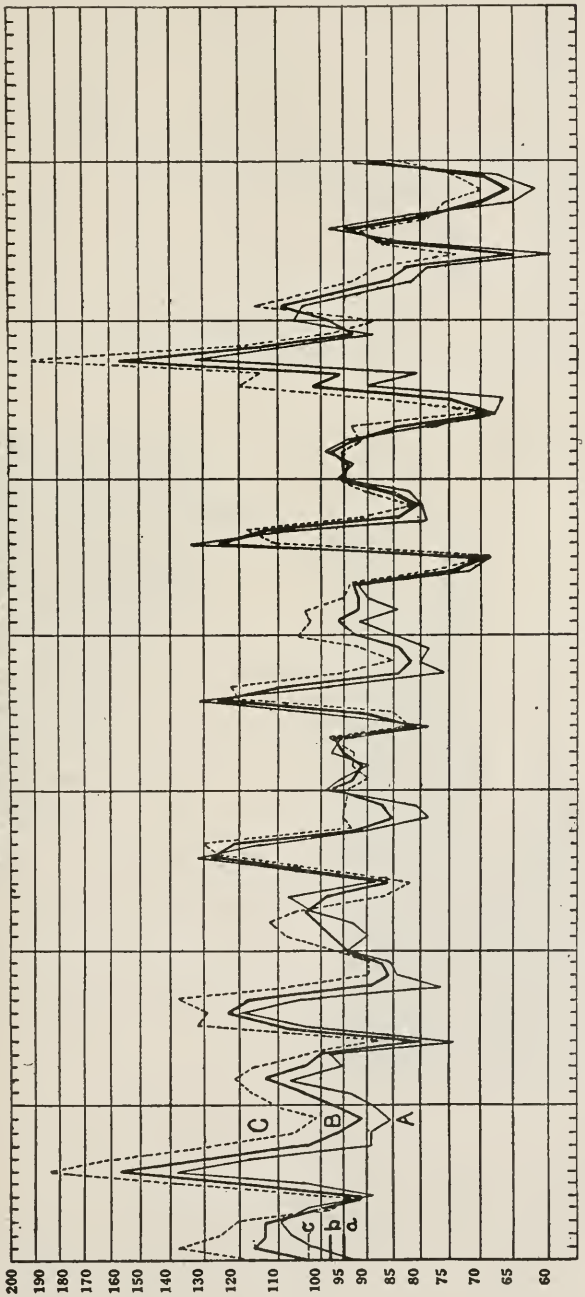


FIG. 6.—From the monthly vital statistics review of the New York State Department of Health for March, 1920. Otto R. Eichel, statistician.

York City. A comparison of what has been accomplished in Utica with New York City is also instructive (Figs. 7, 8 and 9).

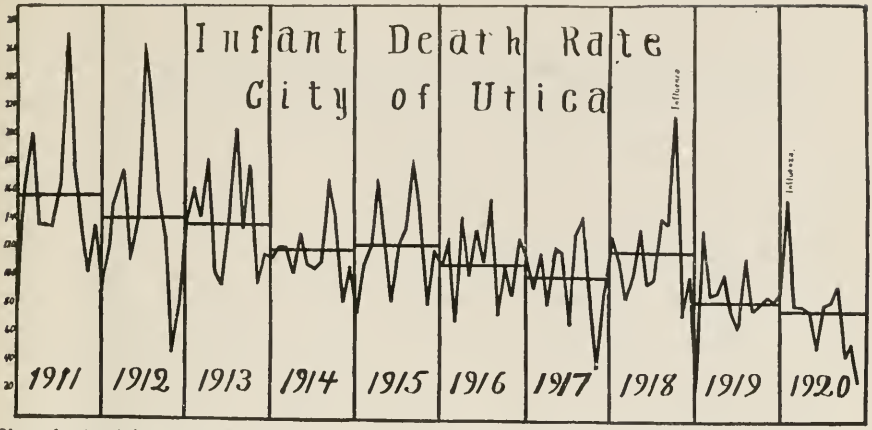


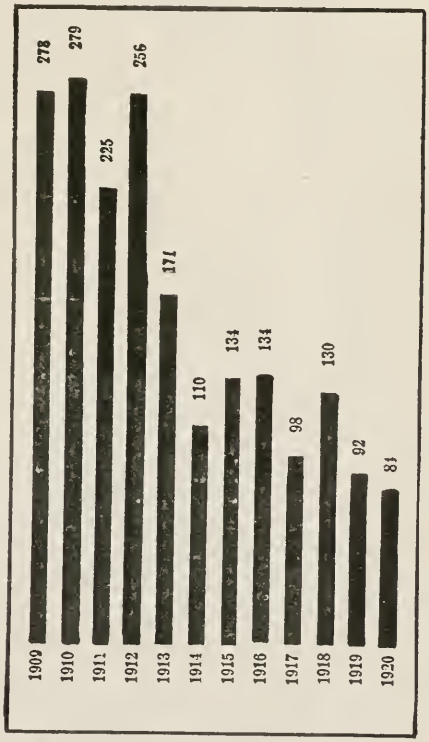
Chart showing infant death rate per month in Utica. Note disappearance of high summer death rate since 1914. Compare death rates for influenza months of 1918 and 1920 with ordinary death rates in 1911 and 1912.

FIG. 7.

Infant Mortality In Utica.

Note rise in infant death rate prior to organization of Utica's Baby Welfare Committee in 1912 and steady decline since that year, except in 1918, the year of the influenza epidemic.

FIG. 8.



Summer Infant Death Rate In Utica.

Deaths per 1,000 births for months of July and August.

FIG. 9.

FIGS. 7, 8 and 9.—Cutting Down Death Toll Among Utica's Babies by T. Wood Clark, M.D., Mother and Child, Vol. 2, No. 10, pp. 458–463 (October, 1921).

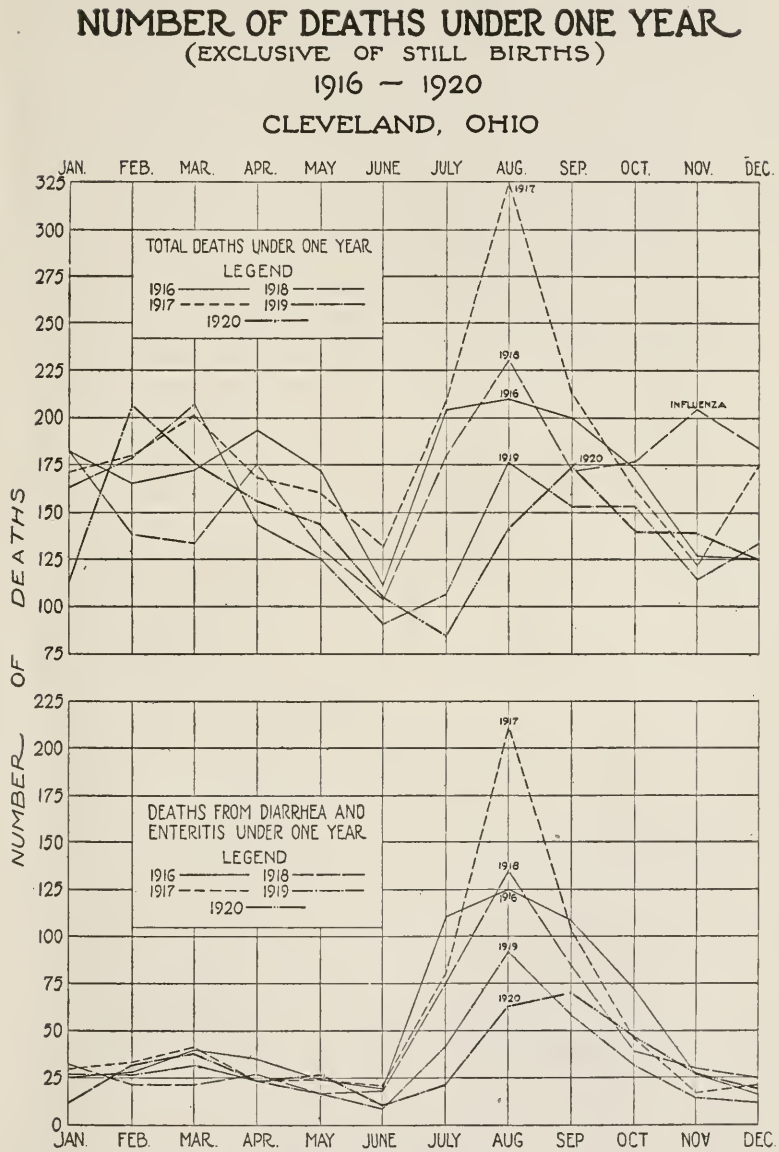


FIG. 10.—Showing the saving of infant life in Cleveland, Ohio, due to a reduction in gastro-intestinal deaths.

(From Data Supplied by Dr. R. J. Ochsner of Cleveland.)

What then has been our actual gain in infant life during the past decade in the United States? In 1900 the deaths under one year of age made up 20.7 per cent. of the total number of deaths at all ages. In 1910 it was 19.4 per cent. and in 1919 deaths under one year of age comprised only 14.4 per cent. of the total deaths. Stated in another way, in 1900 of every eight infants born alive approximately one died before reaching its first birthday, while in 1919 of every 12 born alive only one died before the age of one year. This saving of life is due largely to great reduction in deaths from gastro-intestinal diseases, and in minor degree to a reduction in acute infectious diseases. Table 5 shows the

RESULTS OF WORK OF THE MATERNITY CENTER ASSOCIATION OF NEW YORK

Of 4,500 cases cared for by the association in 1919, there were 6 maternal deaths from causes due to pregnancy or childbirth.

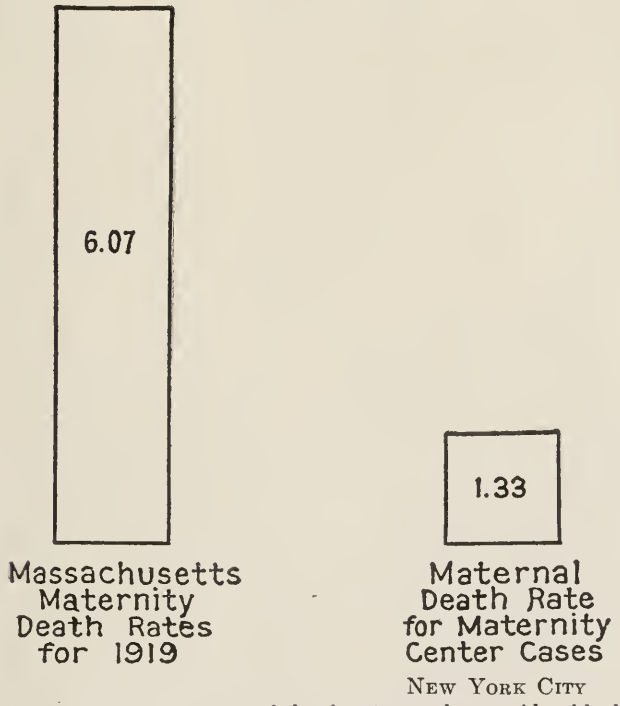


FIG. 11.—Showing that the maternal death-rate can be considerably lowered by suitable prenatal care.

great reduction which has taken place in gastro-intestinal diseases as compared to other diseases of childhood. Taking the city of Cleveland, Ohio, as a typical large industrial community we see in plotting the actual number of infant deaths by months each year for the five-year period 1916–1920 that there has been a remarkable reduction in the total infant deaths. On the same graph will be noted the number

of deaths from diarrhea and enteritis under one year of age for the corresponding period. The decline in total infant deaths is evidently due in large measure to the reduction of deaths from gastro-intestinal diseases (Fig. 10).

Another very interesting point in regard to this graph is that the summer peak of infant deaths, which parallels the peak for diarrhea and enteritis, has been coming down year by year until now the winter

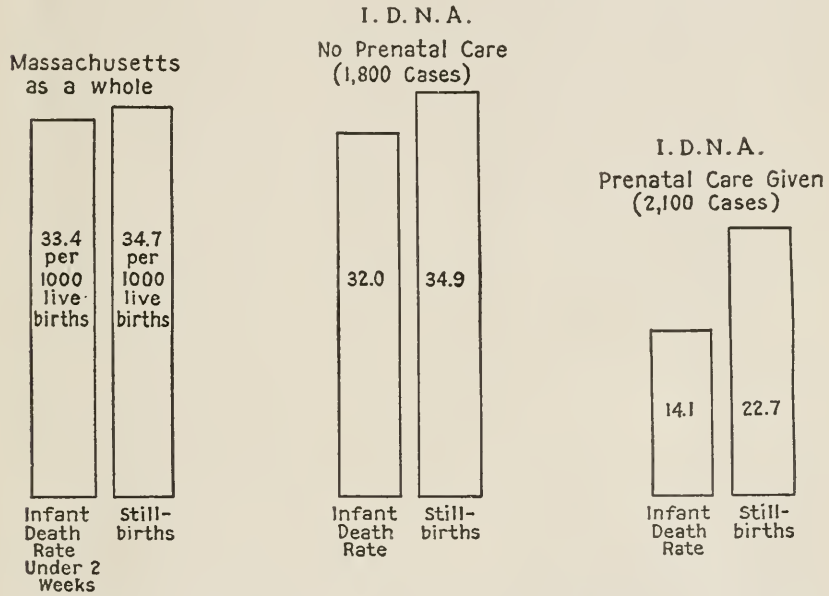


FIG. 12.—Showing reduction of still births and early infant deaths in cases given prenatal care by the Instructive District Nursing Association of Boston.

peak is higher than the summer. This indicates, in a striking way, the necessity for more concerted attack upon the respiratory diseases which now predominate during the winter months. A closer analysis of Cleveland's figures under one year of age revealed a very large proportion of deaths under one month and a high still-birth rate. Knowing, as we do, that the number of still births and deaths under one month can be considerably reduced by suitable prenatal and obstetrical care (see Figs. 11 and 12 which illustrate what has been done in New York and Boston) there is every reason to believe that the infant mortality rate can be still further reduced not only in Cleveland but in every other American community. For instance, in a small well-to-do community such as Montclair, New Jersey, the infant mortality rate in 1920 was only 58, but 46.6 per cent. of the deaths under one year occurred under one week of age.

Prenatal and Neonatal Mortality.—To the layman birth is looked upon as the most important event in life. It signifies the completion of Nature's fruition and marks the beginning of a new life. We know, however, that birth is by no means the beginning of life, but

simply an incident, fraught with many dangers and possibilities, in the larger life of the community. No study of infant mortality, therefore, is complete until we have looked back into prenatal life and considered the possibilities of the potential loss and damage which may not be revealed until after birth.

The study of prenatal life is beset with many difficulties, but an excellent beginning has been made by Ballantyne, Feldman and others. The study of infant mortality should really begin with ante-natal pathology and hygiene. The problems of ante-natal and neonatal mortality have a very intimate relation to the welfare of the mother. The environment of the fetus and newborn is the mother, and any pathologic conditions which affect her react unfavorably upon the infant. It should be borne in mind that the fetus exhibits varying reactions to its environment at different periods of its growth. This has been clearly pointed out by Ballantyne. The high still-birth rate and neonatal mortality reflect seriously upon our care of the pregnant and parturient woman. The high rate of maternal mortality in this country undoubtedly has a direct influence on the mortalities of early infancy. Ballantyne has so well stated the loss in prenatal and neonatal life that his statement is given here in full. "If one takes infantile mortality as 100 per 1000 live births (and that rate is still far exceeded in many places) then something between a half and a third of all these infantile deaths are found to occur in the first month of life. Between 40 and 45 of the infantile deaths are neonatal (i.e., occur in the first month after birth). Obviously, if the fatalities are evenly distributed over the 12 months the neonatal ones should be only 8 or 9; instead of this, more than 40 of them are closely packed into the first month, and if this number were continued during the remaining 11 months the infantile deaths would number 500 out of every 1000 live births.

"The neonatal deaths are serious enough, but the ante-natal ones are far more serious. It will have been noticed that in estimating the infantile and neonatal deaths one always speaks of them as 'so many in 1000 *live* births;' that is to say, they are a superincumbent mortality, and already other deaths have occurred in birth and before birth of which no record is preserved in the 1000. In other words, the dead births require to be added, and there are some 30 or 40 of them in each 1000 births. But even this is not all: every miscarriage means an ante-natal death, for the unborn child is not viable in a miscarriage. There is no certain knowledge regarding the miscarriage rate, but it may be safely stated to be not less 150 per 1000 conceptions. Putting all these facts together the conclusion is reached that if one starts with 1200 conceptions something like 200 of these lives are lost before pregnancy is ended and labor completed; and of the 1000 infants who come into the world alive 40 or 45 die in the first month, i.e., neonatally. Consequently a completely successful campaign to abolish all ante-natal and neonatal deaths would mean the saving of 230 or 240 lives in each 1200 conceptions, or to state it in the milleage, 200

per 1000. Obviously there is a wide field for life-saving endeavors among the ante-natal and neonatal deaths."*

Miscarriages and abortions make up a very large proportion of all pregnancies. Although it is quite difficult to obtain exact statistics regarding abortion it is known from the data we do possess that it is quite frequent. According to a number of obstetricians *one out of every five pregnancies ends in abortion.* Williams admits the difficulty of arriving at any very accurate conclusions regarding abortions, especially in this country. He states that in his maternity service at Johns Hopkins Hospital about 6 per cent of all his patients suffer from abortion.† Referring to Mallins he gives 19.23 per cent of the pregnancies of 2,000 patients ending in abortion, and to Franz that in 15.4 per cent. of the cases admitted to the Lying-in Hospital at Halle abortion occurred.‡

It is conservatively estimated that in private practice about one-fifth or one-sixth end in abortion, although Taussig thinks that one abortion occurs to every 2.3 labors and he estimates that over 25 per cent. of all abortions are "criminally induced."§ The seriousness of induced abortions has received particular attention in Europe for some time. In France where "Birth Control" has been the vogue, abortions have increased at such an alarming rate as to cause the statesmen great anxiety. It was found by Doleris that in the poorer arrondissements of Paris the number of abortions had doubled in some, and even trebled in others, in the years between 1897 and 1905. G. Rimette‖ compiling the statistics of the Paris Maternité from 1897 to 1905 found:

9875 pregnancies
1437 abortions
627 spontaneous abortions
414 complicated abortions
367 infected abortions
27 deaths from abortion.

Miscarriages and Still Births.—When we come to the miscarriages and still births we still find very high rates. Whitehead found the proportion of miscarriages to pregnancies as 1:7 and Priestly as 1 : 4⅓.¶ For the European countries Wappaus estimated the still births as 3.79 per cent. of the total births and Rippin gives the still

* Ballantyne, J. W., The Prevention of Ante-natal and Neonatal Mortality, Nelson Loose Leaf Medicine, vii. Prevention of Disease—Public Health, Chapter XVIII, pp. 436–437. Thos. Nelson and Sons, N. Y. and London (1920).

† Williams, J. Whitridge, Obstetrics, Fourth Edition. D. Appleton and Co., N. Y. (1917), p. 661.

‡ *Ibid.*, p. 661.

§ Taussig, Frederick J., The Prevention and Treatment of Abortion, pp. 4–5. C. V. Mosby and Co., St. Louis (1910).

‖ *Ibid.*, p. 3.

¶ Ballantyne, J. W., Disease of the Fetus, i (1892), p. 8.

births in Prussia for 25 years as 3.69 per cent. of the total live births.* In this country we have no reliable statistics of still births covering a large area. The figures given for the 1918 Census Bureau Report were 3.9 per 100 live births for legitimate and 9 per 100 illegitimate births.† Where figures are given we know that they are considerably below the actual number of still births, for a large number of them are never reported. It is estimated on the figures we have that to every 100 live births there are between four and five still births. In New York City there have been reported as many as six still births to every 100 live births in a single year. In the state of Massachusetts for the year 1919, 3046 still births were reported, which makes a rate of 34.7 per 1000 reported live births. An inquiry sent out by the Metropolitan Life Insurance Company in 1919 to the health officers of all states and larger cities having good birth registration revealed that:

"1. More than five women die from disorders of pregnancy or childbirth out of each 1000 births registered. This is equivalent to one maternal death out of every 185 confinements.

"2. Forty-five babies out of every 1000 total births, or one out of every 22 are born dead.

"3. Forty babies out of every 1000 born alive die before they are one month old."‡

Birth Control.—This terrific loss of life *in utero* or shortly after birth constitutes a serious problem from a biological as well as a social standpoint. Of recent years there has been an alarming increase in the frequency and actual number of induced abortions. This has gone hand in hand with the insidious propaganda for so-called "birth control" or "voluntary parenthood"—a movement which has gained momentum in France, Holland and New Zealand, and has gradually spread to England and the United States. While the birth control enthusiasts would indignantly disclaim any connection between the "contraceptive methods" of "voluntary parenthood" and induced abortions, it is very evident that the more "moral technique" of contraception must often break down and relief from the "accidents" which follow be frequently sought in induced abortion. Thus far contraceptive methods have been practiced largely by the elite and better educated classes. Those most able to bear children and meet their support have been the very ones to shirk the responsibility, while those for whom birth control is claimed to be a great boon still proceed to build up large families. It has been estimated that at least four children to a family are necessary to keep up the stock.

* Cited by Griffith, J. P. Crozer, The Diseases of Infants and Children, i, (1919), p. 211. W. B. Saunders Co., Philadelphia (1919). Allg. Bevölkerungsstatistik, 1859. Ref. Pfeiffer, Gerhardt's Handb. d. Kinderkr., i, p. 551. Also Schmidt's Jahrbücher, cclxxiii (1902), 233.

† Birth Statistics for the Birth Registration Area of the U. S.,1918, p. 30. Fourth Annual Report. Bureau of the Census, Washington, D. C. (1920).

‡ Statistical Bulletin, Metropolitan Life Ins. Co., Louis I. Dublin, Statistician i, No. 3 (March, 1920), p. 1.

This standard is not even being maintained in the United States. There is no question but that the native American stock is rapidly dying out and is being replaced by those races or mixture of races which do *not* refuse to bear children. Note the Russian and Polish Jews on the Atlantic Coast and the Italians and Japanese on the Pacific slope. "Birth control" is simply a refined twentieth century paganism with regard to the undesired child which seeks in the guise of humanity and the argument of "economic necessity" to obtain the maximum of sexual stimulation without incurring the difficulties and responsibilities of parenthood. The only "birth control" that can be considered really "moral" is strict continence, which in theory, at least, has been held by the Jewish and Roman Catholic churches for centuries as a protest against "pagan practices."

The Declining Birth Rate.—It is instructive to recall that a study of the declining birth rate in France was what first led to an intensive investigation of the causes of infant mortality and means for their prevention. The decline of births in France after 1870 led to a condition rapidly approaching national disaster when the deaths threatened to exceed births. A Commission on Depopulation was appointed to make a thorough study of the whole question. The principles evolved from the French study cannot be better stated than as given by Sherman C. Kingsley who paraphrases the Report of the Commission on Depopulation in 1909 giving reasons for the rapid decrease in the number of births (several other causes have been added by the writer):

"1. The spread of the Neo-Malthusian doctrines, which justified the prevention of conception.

"2. The increase of venereal disease, which rendered marriages sterile (or resulted in repeated abortions).

"3. Industrial conditions, which imposed upon working classes poor food, insanitary dwellings and increased employment of women in factories and shops.

"4. The law which forbade investigation of the parentage of an illegitimate child.

"5. The increased ease with which divorce could be obtained.

"6. The lack of special laws for the protection of pregnant women."*

7. (The laws of inheritance which favored the first born and made little provision for the succeeding children in the inheritance of the property.)

While the decrease in the number of children born undoubtedly overshadowed the danger of deaths through the first year of life, measures to prevent infant mortality formed an important part of the work of the Commission on Depopulation. Among these measures may be included:

* Kingsley, Sherman C., "Infant Welfare Activities in European Countries." See "Steps in the Evolution of Baby Welfare Work in Chicago," Pub. by Elizabeth McCormick Memorial Fund, 1914. "Significant Measures in Germany," pp. 25–27.

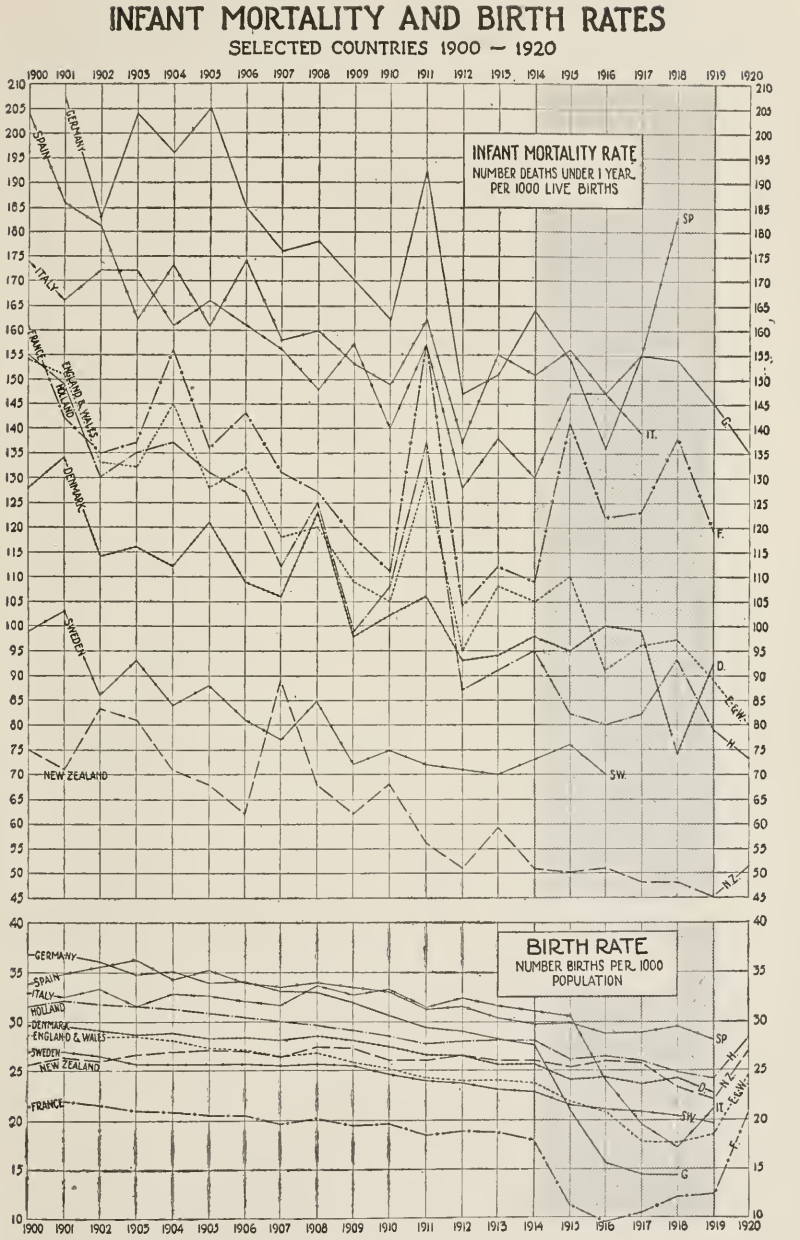


FIG. 13.—The effects of the Great War upon the birth rates and infant mortality are shown in the shaded sections.

1. Consultations for pregnant women.
2. Refuge homes for unmarried mothers and working women.
3. Money grants during pregnancy.
4. Maternity hospitals.
5. Care of women in home during confinement.
6. "Canteens" or restaurants in the poorer quarters of Paris, where any nursing mother could get a meal for a nominal amount, or free of charge if she was too poor to pay. These efforts in France were coupled with the establishment of consultations for nurslings, "gouttes des lait," crèches, etc., which give to France the distinction of being the pioneer in modern organized maternity and child hygiene work.

The declining birth rate in other countries soon attracted the attention of statisticians and statesmen. Efforts were put forth with the hopes of checking it, but with little if any success. It was reasoned that if little could be done to check the decline, much might be done to prevent infant mortality among the smaller number of children born, and hence, this became a stimulus to infant welfare, notably in Germany and Austria. In these latter countries maternity benefits and the promotion of breast feeding were soon important features.

Birth Rates and Infant Mortality Compared.—It is instructive to compare the decline in the birth rates with the fall in infant mortality. This can be readily seen in Fig. 13 where the birth rates and infant mortality rates are given for some of the European countries, over a series of years. The war years have been included so that the bearing of this catastrophe upon infant mortality could be studied. While a high birth rate is often accompanied by a high infant mortality, this is not invariably the case.* In Ireland, for instance, where the birth rate is relatively high, the infant mortality rate is surprisingly low. Since the war the birth rate in England has steadily increased while the infant mortality rate has continued to fall. Conversely a low infant mortality rate is not guaranteed by a low birth rate. It has been noted during certain wars and in other national disasters that while the births dropped off considerably there was not a corresponding increase in infant deaths, e.g., in France during the Siege of Paris in 1870, and during the Lancashire cotton famine, and in England during the late war specific measures for the reduction of infant mortality appear to have more of an influence upon it than fluctuations in the birth rate. There are, however, certain corrections to be made when the number of births falls abnormally low in any one year, and this has been clearly pointed out by the Registrar-General† of England regarding the infant mortality rates in that country during the war.

Factors Influencing the Infant Mortality Rate.—The proportion of male to female infants does have a distinct bearing upon the infant mortality, as the deaths of male infants are uniformly higher than

* Newsholme, Sir Arthur, Address on Neonatal Mortality, Mother and Child, i, No. 1 (June, 1920), pp. 3–4.

† See Eightieth Annual Report of the Registrar-General of England and Wales for 1917, p. 29.

those of female (Table 4). This is also seen in the table of infant mortality according to sex given for Germany for a series of years (Table 10).

TABLE 10.—INFANT MORTALITY IN GERMANY BY SEX, 1901–1918

Rates per 1000 living births of each sex

Years	Males	Females	Total
1901	223	190	207
1902	199	166	183
1903	220	187	204
1904	212	180	196
1905	222	188	205
1906	201	169	185
1907	191	160	176
1908	194	162	178
1909	184	154	170
1910	176	147	162
1911	207	177	192
1912	160	134	147
1913	164	137	151
1914	177	149	164
1915	167	140	154
1916	147	124	136
1917*	167	141	155
1918*	167	140	154

* Excluding Alsace-Lorraine.

Source: 1901–1916 Stat. Jahrbuch. für des Deutsche Reich. 1917–1918 Delbrück, Stat. Reichsamt, Berlin.

While the proportion of male infants has apparently increased in most countries since the War it has had but little effect in increasing the infant mortality in those countries where systematic infant welfare work has been encouraged. This illustrates an important point in infant welfare work, *viz.*, there are so many factors entering into it that one or more favorable factors may offset or balance the untoward ones. For instance, good economic conditions may do much to offset certain factors which are otherwise unfavorable, and an intensive campaign for breast feeding, or pasteurized milk, may neutralize a poor general milk supply.

The age and social status of the mother has something to do with the infant mortality rate. This has been well shown by the admirable studies of the Children's Bureau in a number of typical American cities. The infant mortality rate for infants of mothers between 25 and 29 was the lowest of any age group. It is interesting to note that the largest number of births was among this age group, which again illustrates that a high birth rate among certain age groups does not necessarily imply a high infant mortality (see Table 11).

TABLE 11.—BIRTHS DURING SELECTED YEAR, INFANT DEATHS, INFANT MORTALITY RATE, AND PER CENT. OF STILL BIRTHS, ACCORDING TO AGE OF MOTHER AT BIRTH OF INFANT

New Bedford, Mass.

Age of mother	Total births	Live births	Infant deaths	Infant mortality rate	Still births	
					Number	Per cent. of total births
All mothers	2662	2587	337	130.3	75	2.8
Under 20	112	108	28	259.3	4	3.6
20 to 24	737	725	93	128.3	12	1.6
25 to 29	853	833	95	114.0	20	2.3
30 to 39	840	809	105	129.8	31	3.7
40 and over	120	112	16	142.9	8	6.7

From Infant Mortality Study of New Bedford, Mass., by J. S. Whitney. Infant Mortality Series No. 10, Bureau Pub. No. 68, U. S. Children's Bureau, Washington, D. C., 1920.

The relative number of first-born children in any one year has a distinct bearing not only upon the number of infant deaths but upon the maternal mortality as well. On the average the first-born children have a 33 per cent. higher mortality than the second born. The still-birth rates for males and also for first-born infants are in excess of those for females and for second and following births.

The nationality and nativity of the mothers and the length of residence in this country influence to a considerable degree the infant mortality rate. Furthermore, colored populations residing in this country for some time exhibit marked differences in infant mortality. The Negro race has always had a high infant mortality compared with the white and with other colored races. Some idea of the differences in mortality can be obtained from Table 12. The differences in the mortalities of infancy among foreign born mothers was well brought out in the studies of the Children's Bureau. In small countries where nationality is more homogeneous this factor in the infant mortality is largely eliminated. The relative amount of breast feeding among the various nationalities in this country also has a definite bearing upon the infant mortality rate.

Urban and rural infant mortality rates differ considerably throughout the country, but it is difficult to make any statement which will cover broadly the influence of rural or urban life upon infants. The local conditions will largely determine the trend of infant mortality. Some idea of the variation of urban and rural infant mortality rates in the United States may be obtained from Table 13. For a detailed analysis of the causes of infant deaths in city and country the reader is referred to the Infant Mortality section of the Birth Statistics

Reports for the Registration Area of the U. S. issued by the Bureau of the Census.

Table 12.—Infant Mortality Rates for the Registration Area of U. S.

	1915	1916	1917	1918	1919
The registration area (total)	100	101	94	101	87
White	99	99	91	97	83
Colored	181	185	151	161	131
Cities in registration area (total)	103	104	100	108	89
White	102	102	96	105	86
Colored	181	177	185	197	148
Rural parts of registration area (total)	94	97	88	94	84
White	94	95	84	90	80
Colored	182	203	134	143	123

Table 13.—Urban and Rural Infant Mortality Rates by States

Birth registration states, 1919*	Infant mortality rates		
	Total	Urban	Rural
Total	87	89	84
California	70	64	79
Connecticut	86	86	87
Indiana	79	88	74
Kansas	70	88	65
Kentucky	82	105	78
Maine	91	89	91
Maryland	105	98	115
Massachusetts	88	90	82
Michigan	90	97	82
Minnesota	67	68	66
New Hampshire	93	101	85
New York	84	85	77
North Carolina	84	124	82
Ohio	90	94	85
Oregon	63	69	59
Pennsylvania	100	99	101
South Carolina	113	139	111
Utah	71	74	69
Vermont	85	121	79
Virginia	91	106	87
Washington	63	59	67
Wisconsin	80	94	71
District of Columbia	85	85	

Source: Birth Statistics, 1919. U. S. Bureau of Census.

* N.B.—The birth registration area comprises 58.6 per cent. of the population of this country, or 61,474,111, including Rhode Island (for 1919).

Illegitimacy.—In all countries illegitimate babies have a slimmer chance of surviving the first year than the legitimate ones. In foreign countries where careful statistics are kept regarding this condition the infant mortality rate among the illegitimate is about twice as high as among the legitimate babies (Tables 14 and 15 for England and Wales, and Germany). The causes underlying this difference are not difficult to discover. Many of the illegitimate babies are premature or suffer from syphilitic infection. The social stigma which still unfortunately falls upon the mother alone prompts her early to get rid of the baby in some way. If placed in an institution its chances of surviving are further reduced, as it not only loses the personal care of its mother but also the breast milk which may be its salvation. In foundling institutions of Europe it is often possible to secure wet nurses for the unfortunate babies and thus prolong their lives. If the mother can be persuaded to keep her baby during the perilous first few months it may do fairly well, but the temptation to get out to work and leave the baby in a boarding home, or in the care of a questionable helper, is so great that the mother often capitulates. The whole problem of illegitimacy has received considerable attention during the War and since. As a cause of infant mortality aside from its social complex it deserves special attention.

TABLE 14.—INFANT MORTALITY IN ENGLAND AND WALES BY LEGITIMACY
Deaths of infants under one year per 1000 live births

Years	Legitimate	Illegitimate	Total
1906	127	261	132
1907	113	220	118
1908	116	233	120
1909	104	211	109
1910	102	195	105
1911	125	245	130
1912	91	181	95
1913	104	213	108
1914	100	207	105
1915	105	203	110
1916	87	183	91
1917	90	201	96
1918	91	163	97
1919	84	187	89

Source: Eighty-second Annual Report of the Registrar-General of Births, Deaths and Marriages in England and Wales, 1919.

TABLE 15.—INFANT MORTALITY IN GERMANY BY LEGITIMACY
Rates per 1000 living births

Years	Legitimate	Illegitimate	Total
1901	194	339	207
1902	173	293	183
1903	193	327	204
1904	186	314	196
1905	194	326	205
1906	175	294	185
1907	166	280	176
1908	168	285	178
1909	160	268	170
1910	152	257	162
1911	182	299	192
1912	139	232	147
1913	142	237	151
1914	154	253	164
1915	144	253	154
1916	126	213	136
1917*	143	257	155
1918*	141	239	154

* Excluding Alsace-Lorraine.

Source: Delbrück, Stat. Reichsamt., Berlin, Nov., 1919.

Infant Feeding.—There is no question that the character of feeding during the first year of life is the main factor in the health destiny of the baby. Although prenatal and natal conditions may largely account for neonatal deaths we must look to difficulties in feeding as the inderlying cause of the disorders which result in so many deaths during the later months. The early establishment of breast feeding is of paramount importance. Upon this point there should be no controversy between the obstetrician and pediatrist. Valuable time is sometimes lost in the early days of life because the obstetrician in his solicitude for the mother overlooks the importance of early establishment of proper nursing habits. In every country there is unanimity of opinion as to the supreme value of breast feeding as a preventive of infant mortality. Our whole clinical experience, strongly supported by laboratory research, affirms that mother's milk is the safest and best food for the infant and by all odds the most economical. There is no real substitute for mother's milk.

It is unnecessary here to quote exhaustive figures to prove what we all know so well, that the breast fed baby's chances of surviving the first year are much greater than those fed upon proprietary foods or even modified cow's milk. While great strides have been made in the production of certified milk, in the commercial pasteurization of market milk and in the preparation of dried milks which have on the whole proved satisfactory, it still remains true that mother's milk is

the milk *par excellence* and should be guaranteed to every baby when physically possible.

A decade or so ago when refinements in artificial feeding were being introduced—when the percentage method was competing with simple dilutions—there was a tendency on the part of a number of physicians to acquiesce in the wishes of their patients to wean the baby on the slightest pretext and attempt to substitute a cow's milk modification or a proprietary food. This was greatly encouraged by adroit advertising by the manufacturers of patent foods. It looked for a time as though breast feeding was rapidly going out of vogue, at least among the native born Americans. Thanks to the persistent efforts of our pediatrists and the educational work carried on by child hygiene workers, breast feeding has gradually regained its ground until in some communities from 80 to 90 per cent. of the mothers are nursing their babies. It has been shown by Sedgewick, Herman Schwartz and others* that by suitable methods of manual expression it is possible to reestablish breast feeding after long periods of apparent dryness and that it is feasible to get practically every mother to nurse her baby for at least part of the time. Hoobler† in Detroit has demonstrated the practicability of conducting a "human dairy," and of supplying human milk to mothers who could not really nurse their own babies.

Breast Feeding and Immunity.—Investigations have proved that mother's milk is not only the best protection against the gastro-intestinal diseases, but also that babies taking it thrive more normally and appear to exhibit a greater immunity to the infectious diseases. If any of the infectious diseases are contracted the breast fed babies have a better chance of recovery and exhibit fewer unfavorable sequelæ. While rickets, scurvy and beri-beri have been known to develop in breast fed babies, their occurrence is relatively rare where the dietary of the mother contains the necessary food elements, and where the babies are not nursed exclusively at the breast for too long a period. Rickets and scurvy are extremely rare in China where breast feeding is well nigh universal.‡ They were practically unknown, even in the treaty ports, until artificial feeding was introduced by the foreigners. In the Orient babies fed at the breast of beri-beric mothers have de-

* Annual Proceedings of the American Association for Study and Prevention of Infant Mortality (American Child Hygiene Association).

1. Sedgewick, J. P., Maternal Feeding, 3d Annual Meeting (1912), pp. 195–205.

2. Schwartz, Herman, Nursing Statistics Derived from the Study of the Infancy of 1500 Children and a Contribution to the Cause of the Summer Infant Mortality, 1st Annual Meeting (1910), pp. 207–215.

3. Rudd, Nathalie C. Breast Feeding Propaganda as Applied to a Birth Registration of 9000 (in Minneapolis), 8th Annual Meeting (1920), pp. 89–96.

† Hoobler, B. Raymond, Problems Connected with the Collection and Production of Human Milk, Jour. A. M. A., lxix, No. 6 (Aug. 11, 1917), pp. 421–429.

Hutzel, Eleonore L., The Detroit Bureau of Wet-nurses. Mother and Child, ii, No. 7 (July, 1921), pp. 316–319.

‡ Bolt, R. A., The Chinese Child, *ibid.*, ii, No. 3 (March, 1921), pp. 99–106.

veloped acute beri-beri. In Manila and Japan at one time infantile beri-beri was an important cause of death.*

Meteorological Factors.—It is well known that climate has an influence upon infant mortality, but just how the meteorological factors balance one another is not so well defined. The relation of excessively hot and dry summers to infant mortality has been pointed out in a number of studies. In comparing the infant mortality of different countries, or of parts of the same country, the differences in climate must always be carefully considered. For instance, the climate of New Zealand is very favorable to low infant mortality. The favorable climate is quite apt to be accompanied by more favorable housing conditions, as is also found in New Zealand. Another notable example is seen on the Pacific slope of United States where the infant mortality rates have been on the whole the lowest in this country. There is no question that cooler summers, especially when accompanied by cool nights, and milder winters have had a good deal to do with keeping the infant mortality rates down in California. It should be noted, however, that the infant mortality in the early months of life here and there throughout California is as high as in many other parts of the country. It must be remembered that in some sections of the west —in Washington and Oregon—the age distribution of the population is more favorable to a low infant mortality. It is a matter of considerable interest that while climate favors the far west, a number of cities in the middle west and the east are now showing infant mortality rates comparable to those in the west. It is fair to conclude that even the unfavorable effects of the eastern climate may be neutralized to some degree by intensive child hygiene efforts. At any rate a reduction of neonatal deaths is open to east and west alike, as climate probably has but little influence upon the early deaths.

Heat and Infant Mortality.—Several interesting studies of the relation of heat to infant mortality have been made in this country and important contributions to our knowledge have come from abroad. A most exhaustive and painstaking investigation was carried out by Liefmann and Lindermann† who studied this question for a period extending over 15 years in the city of Berlin. Figures 14 and 15 based upon their observations were prepared by Schereschewsky of the Public Health Service and two of them are presented here. Schereschewsky‡ has given an excellent summary of our knowledge regarding the relation of heat to infant mortality with an extensive bibliography up to the year 1913. He pointed out that "by far the most conspicuous phenomenon in connection with the mortality of infants is the well-

* Vedder, E. B., "Beri-beri" (1913), pp. 242–43. Bibliography, pp. 330–336.

† Liefmann, H., and Lindemann, A., Der Einfluss der Hitze auf die Sterblichkeit der Saüglinge in Berlin und einigen anderen Grossstädten, Viertljhr. f. Off. Gesundhtspflg, xliii (1911), pp. 333–375.

‡ Schereschewsky, J. W., Heat and Infant Mortality, Proc. American Association for Study and Prevention of Infant Mortality, 4th Annual Meeting (1913) pp. 99–132. Reprinted in the Public Health Reports (Reprint No. 155), xxviii, No. 49 (Dec. 5, 1913).

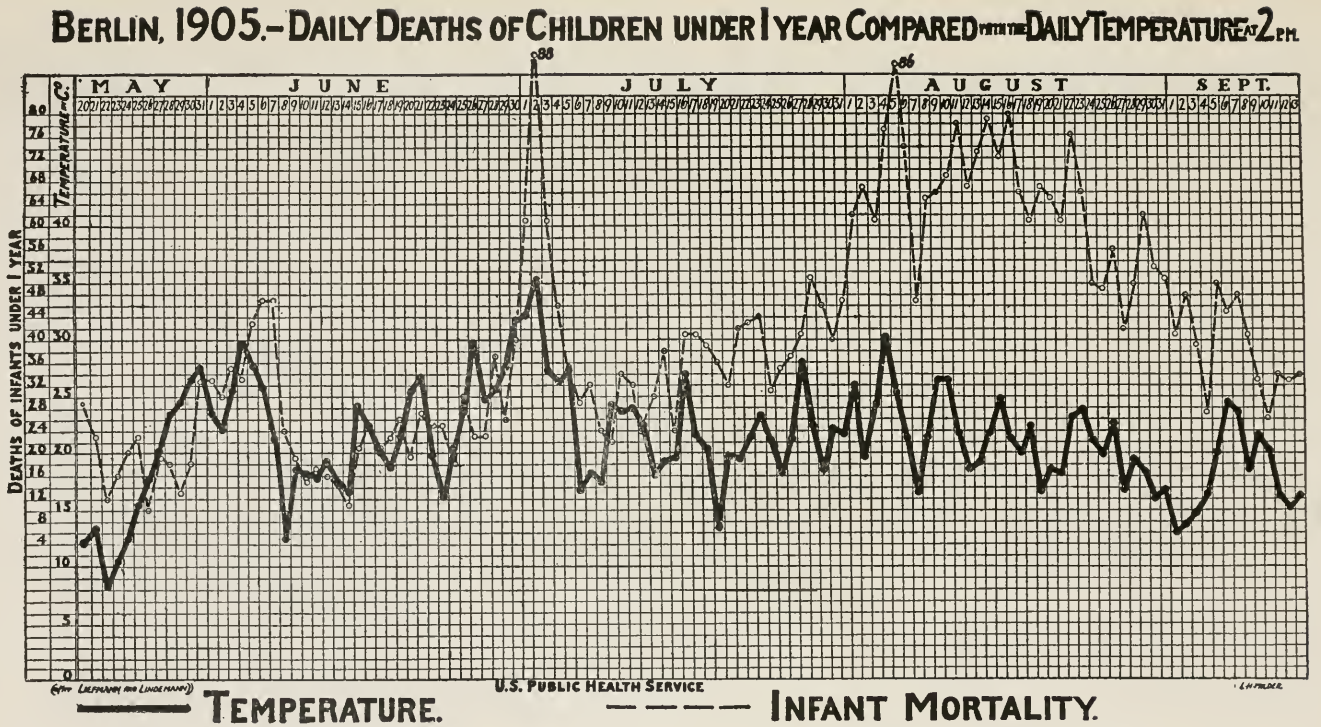


FIG. 14.—Relation of daily infant deaths to daily temperatures in Berlin, during the year 1905, which had a relatively hot summer. See: Schereschewsky, J. W., Heat and Infant Mortality, Proc. 4th Annual Meeting A. A. S. P. I. M. (1913), p. 102.

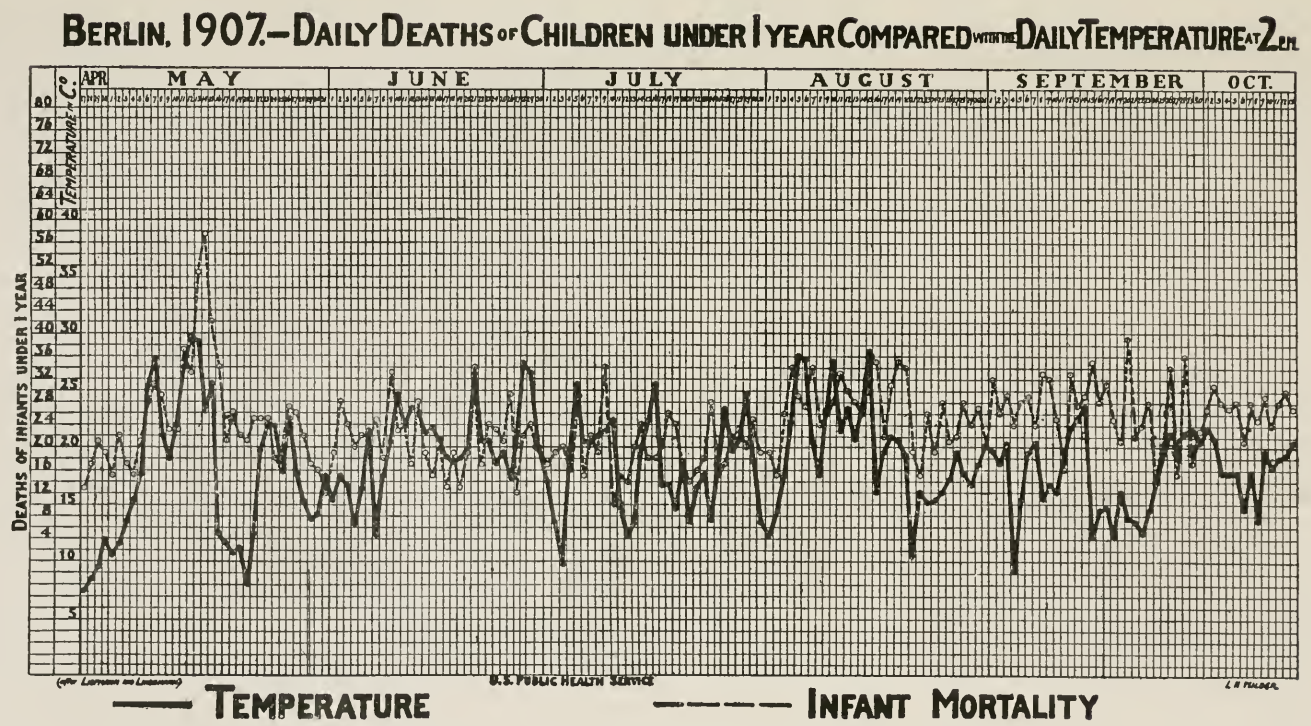


FIG. 15.—Showing relation of daily temperatures to daily infant deaths in Berlin during a cool summer, 1907. *Ibid.*, Fig. 14, p. 104.

known increase in the number of their deaths which takes place in the summer months. No incidence of death in any other age group seems to be so immediately determined by meteorological conditions." His conclusions are so cogent that it is well to state them here:

"1. The action of heat as a direct cause in the summer mortality of infants has been greatly underestimated in the last 25 years. In the future much more weight should be given to its influence.

"2. The lethal action of heat is a function, not so much of the maximum and mean temperatures of the external air as of the indoor temperatures which, in the late summer, may continue to be high, in spite of remissions in temperature of the external air.

"3. The action of dirty and stale milk in causing the death of infants has been given a significance which has overshadowed other factors of equal or greater importance.

"4. There is evidence to show that a certain proportion of infant deaths are due to specific infections, in the dissemination of which contact infection and flies doubtless play a part.

"5. As a result, future activities for the prevention of infant mortality must concentrate themselves to a greater extent on the question of housing, especially the conditions productive of high indoor temperatures, such as overcrowding, narrow streets and the absence of thorough ventilation.

"6. Poor housing conditions can be partially neutralized by the proper care of babies in the summer. The general public should be educated as to the importance of high indoor temperature in causing the death of infants, and especially as to measures which prevent babies from suffering from the heat.

"7. Breast feeding must still be regarded as a most, if not the most, important preventive of the summer death of infants."*

Heat, therefore, has both a direct and indirect bearing upon the summer mortality of infants. The heat may be so intense at the beginning of the summer that a certain number of babies will suffer from primary heat stroke and succumb before anything can be done to save them. This happens even to normal breast fed babies, especially to those of the tenement districts where the indoor temperatures are high and do not fall during the night. If the hot spell is prolonged, more and more babies loose their resistance. If artificially fed a gastro-intestinal disturbance may intervene and lead to serious results. Even after the hot wave recedes the infant deaths may remain unduly high.

Hot weather hygiene for infants is now well recognized. Through the instruction of public health nurses in the homes and the broader educational campaign of the press it has been possible to cut down considerably the summer deaths due directly or indirectly to heat.

Economic Condition.—A number of careful studies have been made abroad and in this country to determine the relation of economic and social status to infant mortality. While the methods of investigation have differed and the completeness of the data been variable, there

* *Ibid.*, p. 125.

has been general agreement that the income of a family has a distinct bearing upon the infant mortality within the family group. The infant mortality studies of the Children's Bureau in a number of American cities indicate this clearly as is seen in the following table showing the infant mortality rates according to the father's earnings (Table 16). The condition of well-being or of poverty in a family not only manifests itself in a decreasing or increasing infant mortality, but is reflected also at higher ages. This has been well shown by Concetti* for Italian families (Table 17).

TABLE 16.—INFANT MORTALITY RATES BY FATHER'S EARNINGS*

City	Deaths of infants under one year of age per 1,000 live births, by specified annual earnings of father		
	All earnings	$1250 and over	Under $550
All cities	111.2	64.3	151.4
Johnstown	130.7	87.6	260.9
Manchester	165.0	58.3	204.2
Brockton	96.7	73.5	67.1
Saginaw	84.6	22.2	142.0
New Bedford	130.3	59.9	168.7
Waterbury	122.7	68.4	151.1
Akron	85.7	40.0	117.5
Baltimore	103.5	64.7	138.0

* Compiled from Infant Mortality Studies of the Children's Bureau, U. S. A.

TABLE 17.—FROM CONCETTI†

	Per cent. of total deaths		
	Wealthy	Middle class	Working class
Deaths from 0 to 1 year	8.9	17.5	30.5
Deaths from 1 to 2 years	1.9	5.5	11.5
Deaths from 3 to 5 years	2.6	6.5	13.6
Deaths from 6 to 10 years	1.3	3.8	6.8
Deaths from 11 to 14 years	0.8	1.1	2.5

When we study the mortalities of infancy in relation to the father's occupation confirmatory evidence of the close relation of economic and social status to infant mortality is brought out. This can be tabulated from figures presented in the Report of the Registrar-General for Births, Deaths and Marriages in England and Wales for the year 1911 as follows:

† Concetti, Luigi, L'Igiene del Bambino Seconda Edizione, Roma (1914), Tabella XIV, p. 12.

TABLE 18

Occupation of Father	Infant Mortality, Deaths under One Year per 1,000 Live Births
Upper and middle class	76.4
Agricultural laborers	96.9
Shopkeepers, dealers, etc	106.4
Skilled workmen	112.7
Intermediate workmen	121.5
Textile workers	148.1
Unskilled workmen	152.5
Miners	160.1
Total under one year (1911)	130.0

Back of these figures are to be found not only differences in social position but many other closely interwoven factors. Ignorance and poverty, as has so often been pointed out, are basic factors in the infant mortality problem. The extension of general education, especially along lines of sanitation and hygiene, and the maintenance of a sound national economic life should do much in keeping down the infant mortality rate.

Prenatal Care.—From this brief consideration of the more important contributing causes of infant mortality let us turn to some of the direct causes and see what can be done to meet them by public health measures. The seriousness of the prenatal deaths has already been mentioned. In writing upon "Certain Neglected Aspects of the Problem of Infant Mortality," Van Ingen has said that, "while a great deal has been done for babies who are old enough to be watched from prophylactic dispensaries and from milk stations, very little organized effort has been made until recently to prevent those deaths due to ante-natal influences. In 1908 the Pediatric Department of the New York Outdoor Medical Clinic undertook the systematic care of expectant mothers registered at this clinic. This work has been under the care of Dr. Herman Schwartz, and has been carried on in a most efficient way. Since 1909 the Committee on Social Service of the Women's Municipal League in Boston have carried on a campaign of prenatal instruction. Their patients have all been women who were confined by a physician or in hospitals. No cases who were to be attended by midwives were accepted. In most cases a small fee was paid by these women. A certain amount of care of expectant mothers has also been carried on since 1908 by the New York Association for Improving the Condition of the Poor, through their Caroline Rest nurses."*

In the summer of 1911 the New York Milk Committee initiated an experiment in prenatal nursing and instruction. A corps of trained public health nurses who were given very definite instructions in prenatal care were placed in a district in Manhattan. These nurses

* Van Ingen, Philip, New York Medical Jour., xiii, No. 11 (Nov., 1913), pp. 605–607.

visited pregnant mothers referred to them from various sources. The women were urged to keep in close touch with their physician or a maternity dispensary. This experiment proved so successful that it was taken over by the city Bureau of Child Hygiene and eight full time nurses placed on prenatal work.

Perhaps the most completely developed plan of prenatal service is that of the Maternity Center Association of New York City. The set-up of the service has been fully described by Miss Anne A. Stevens, its Director, and is given here in her own words:

"At the suggestion of a committee of obstetricians, Manhattan was divided into ten zones, and it was planned to establish maternity centers and substations in each of these ten zones; each center to be the focus of an educational campaign for maternity care for that zone, to conduct doctor's clinics where medical supervision will be given all patients who have not engaged their own physician or registered at a hospital until such time as they can be persuaded to do so; the nurse in charge of each center together with nurses in coöperating clinics to reach practically every pregnant mother in the zone, to teach her the need for medical and nursing care throughout pregnancy, teach her what and how to prepare for her baby, help her arrange for her care at time of confinement and keep in close touch with her until she really knows how to care for her baby. It was planned that each center consist of an examining room where a doctor's clinic could be held once a week or oftener, a dressing room for patients in order to assure them privacy and a waiting room, made as nearly like a comfortable sitting room as possible, where there could be a continuous exhibit of a model baby's bed, layette, toilet tray, etc., and a bed properly made for the mother's delivery. This work was to be financed and directed by this voluntary organization of citizens called the Maternity Center Association, only until such time as a demonstration could be made so convincing as to assure an adequate appropriation of public moneys to carry it on.

"When the association was formed, the New York Milk Committee took the entire responsibility for the work in two of the zones. The Women's City Club continued to finance the work in the zone where they established the first Center, but put the actual nursing under the direction of the Maternity Center Association."*

The results of the prenatal care given by the Maternity Center Association of New York and the Instructive District Nurses Association in Boston are so striking that they were presented in graphic form in the Report of the Special Commission to investigate Maternity Benefits in Massachusetts, and are here reproduced (Figs. 11 and 12).

Institutional Mortality.—The infant mortality in institutions erected for their care has always been excessively high. In the seventeenth and eighteenth century foundling asylums of Europe the mortality ranged from 75 to 100 per cent. among babies in their first

*Stevens, Anne A., The Work of the Maternity Center Association, Trans., 10th Annual Meeting of American Child Hygiene Assoc. (1919), pp. 43–63.

year. Some few institutions by extreme care and individual attention with the aid of wet-nurses were able to reduce the mortality somewhat, but even at the best many more babies died in institutions than died among those who were left with their own mothers or placed out in boarding homes. During the twentieth century the institutions have been greatly improved so far as sanitary conditions are concerned. More individual attention is given, and the feeding is scientifically carried out. In a few of the modern institutions for foundlings and abandoned babies a surprisingly low mortality rate is maintained, especially among those who have passed the first few perilous months. The neonatal mortality in institutions is still quite high, but in properly conducted lying-in hospitals, where suitable prenatal care has been given, the early mortality has been greatly reduced. One of the best studies of institutional mortality of the new-born is that by Holt and Babbitt based upon a careful analysis of 10,000 consecutive births at the Sloane Maternity Hospital in New York.* They found that the neonatal deaths during the first 14 days in the hospital numbered 3 per cent. of the living births, and that for 50 per cent. of this number "prematurity" could be assigned as a cause of death. Forty-eight per cent. of the total deaths and 66 per cent. of the premature deaths occurred on the first day. "Congenital weakness" and "atelectasis" were given as a cause of death in 58 per cent. of the total deaths. Accidents of birth made up about 20 per cent. of the deaths in the first 14 days. Syphilis was given as a cause of death in 4 per cent. of the cases, and played a large part in the still births.

The consensus of opinion of those who have studied the institutional problem in relation to child welfare is that the fewer days spent in an institution the better. Every effort should be made to keep the baby with its own mother, but where this is absolutely impossible well selected and carefully supervised boarding homes for babies ought to be provided. The ideal "home" should not take more than two babies and the compensation given should make it possible for the babies to secure the best of care. Not only should such "homes" be thoroughly supervised by the health authorities, but the babies in them be taken regularly to an infant welfare center for periodic examination and adjustment of their feeding.

Syphilis.—A searching study of the early deaths reveals that congenital syphilis is a cause in more than the death returns seem to indicate. Many deaths from syphilis are undoubtedly obscured in our vital statistics by being simply reported as "still births," "premature births," "congenital debility," etc. Every still birth should be carefully registered and if at all possible its exact cause determined. Such an examination of the still births occurring in maternity hospitals and out-patient work has shown that syphilis is probably the largest

*Holt, L. Emmett, and Babbitt, Ellen C., Institutional Mortality of the Newborn, Proc. A. A. for S. and P. of Infant Mortality, 5th Annual Meeting (1914), pp. 151–160.

cause of still births. The recent work of Williams at Johns Hopkins and Jeans at Washington University in St. Louis confirm our earlier conclusions and point to syphilis as not only an important cause of still births, but of a considerable number of deaths of full term infants as well. By Wassermann reactions applied to the maternal, placental and fetal bloods and a careful study of the placentæ for syphilitic lesions and spirochetæ pallida it is now possible to gain a much fuller picture of syphilis of the newborn.

In a critical study of 302 fetal deaths occurring in 4,000 consecutive deliveries at Johns Hopkins Maternity between April, 1916, and December, 1919, Williams* found the following (212 of the dead babies coming to autopsy):

Table 19

Cause of death	Number of cases	Percentage
Syphilis	104	34.44
Dystocia	46	15.20
Toxemia	35	11.55
Prematurity	32	10.59
Cause unknown	26	8.61
Placenta previa and premature separation	16	5.28
Deformity	11	3.64
Eleven other causes	32	10.69
	302	100.00

Of the 4,000 women studied as regards syphilis 421 gave a positive Wassermann reaction. These patients were grouped in three classes: (*a*) No treatment, (*b*) inefficient treatment, the patients who received two or three salvarsan injections but no after treatment, and (*c*) satisfactory treatment, "the patients received from four to six injections of salvarsan followed by a course of mercurial treatment, with the result that the Wassermann became negative and remained so." The results are shown in the following table:

Table 20

Treatment	Number of Patients	Per Cent. of Children Born Dead or Presented some Evidence of Syphilis
(*a*) No treatment	157	52.0
(*b*) Inefficient	103	37.0
(*c*) Satisfactory	163	7.4

* Williams, J. Whitridge, The Significance of Syphilis in Prenatal Care and in the Causation of Fetal Death, Bulletin of the Johns Hopkins Hosp., xxxi, No. 351 (May, 1920), p. 143.

Williams therefore concludes that "the evidence at our disposal shows that if syphilis is recognized early in the pregnant woman, and is intensively and appropriately treated, almost ideal results may be obtained so far as the child is concerned. Consequently, there is every reason to hope that in the future syphilis may be practically eradicated as the cause of fetal death in all properly conducted clinics in which the women register prior to the middle of pregnancy."*

An exhaustive review of the literature of syphilis as it bears upon infancy and childhood has been presented by Jeans.† He has also made a careful study of syphilis in its relation to infant mortality. Those interested in this important phase of the subject should consult the work of Jeans. He very properly points out that we must take into consideration not only the infant mortality from this devastating disease but also its prevalence among all individuals of the procreating age. In other words, syphilis is eminently a "social disease" and its social roots must be discovered and grubbed up before we can hope to eliminate its influence upon the mortalities of infancy and childhood. In order to show how widespread syphilis is among our general population and to bring out how this affects the infant mortality the following tables from Jeans are given:

TABLE 21.—WASSERMANN SURVEY AMONG ADULTS ADMITTED TO HOSPITALS AND DISPENSARIES‡

City	Number examined	Number having positive Wassermann	Per cent. having positive Wassermann
Baltimore	1,080	116	10.8
Boston	4,000	600	15.0
Chicago	418	56	13.4
Ann Arbor	2,771	160	5.8
San Francisco	6,995	518	7.4
Total	15,264	1,450	9.5

In an examination of 11,933 accepted U. S. Army recruits Vedder found 13 per cent. gave a positive Wassermann and among 856 candidates for the police force in Washington, D. C., 15 per cent. were positive.

* *Ibid.*, pp. 144–45.

† Jeans, Philip C., American Jour. of Diseases of Children, xx (1920), pp. 54–74 and 132–152.

‡ Jeans, Philip C., Syphilis and Its Relation to Infant Mortality, Trans. Am. Assoc. for Study and Prevent. Inf. Mortality, 9th Annual Meeting (1918), pp. 146–156, Tables I and II.

TABLE 22.*—WASSERMANN SURVEY AMONG MARRIED PREGNANT WOMEN

CITY	NUMBER EXAMINED	PER CENT. HAVING POSITIVE WASSERMAN
Chicago	116	10.6
Brooklyn (1)	1822	8.0
Brooklyn (2)	892	7.9
Philadelphia	40	7.5
New York	2488	11.5
Total	5358	9.66

* *Ibid.*, Table II.

The bearing of this high percentage of syphilis in adults of child-bearing age upon fetal deaths is brought out in the following table:

TABLE 23.†—SHOWING THE FREQUENCY OF FETAL DEATH IN SYPHILITIC FAMILIES

Authorities	Families	Total pregnancies	Miscarriages and still births	Per cent.
Holt	193	427	123	28.8
Love	21	172	32	18.6
Harman	150	1001	172	17.2
Jeans	100	331	131	40.0
Jamieson	71	253	95	37.5
Hochsinger	134	569	253	44.4
Raven	82	350	101	28.9
Post	30	168	53	31.6
Haskell	58	167	44	26.2
Tarnier	42	90	56	62.0
Julien	...	206	44	21.4
Pileur	...	414	154	37.0
Totals	...	4148	1258	30.3

† *Ibid.*, Table III.

From this mass of statistics, and others referred to in the original communications, Jeans draws the conclusions:

"1. From 10 to 20 per cent. of adult males and about 10 per cent. of married women are syphilitic and a minimum of 10 per cent. of marriages involve a syphilitic individual.

"2. Seventy-five per cent. of all the offspring in a syphilitic family are infected.

"3. In a syphilitic family 30 per cent. of the pregnancies terminate in death at or before term, a waste three times greater than is found in non-syphilitic families.

"4. Thirty per cent. of all the living births in a syphilitic family die in infancy as compared to a normal rate of 15 per cent. in the same class.

"5. Probably 25 to 30 per cent. of clinically syphilitic infants die as a result of syphilis.

"6. But 17 per cent. of all the pregnancies in syphilitic families result in living non-syphilitic children who survive the period of infancy.

"7. About 5 per cent. of our infant population is syphilitic.

"8. According to St. Louis vital statistics, 3.5 per cent. of all infant deaths are ascribed to lues."*

Jeans entertains essentially the same opinion as Williams that considerable can be done in the way of treatment of the pregnant mother in preventing the large number of fetal and neonatal deaths which we now see from this cause. In order to be effective the treatment must be begun early and continued over a sufficient period. Only through a well organized prenatal service can this be carried out. In all dispensary and hospital practice the Wassermann reaction should be a routine procedure. After treatment is started a thorough follow-up of each case is necessary. Here, as is the case with tuberculosis, the application of social and economic measures is all important.

Tuberculosis.—Our knowledge of tuberculosis in childhood has been considerably extended during recent years. The routine application of the von Pirquet test, the use of the Roentgen rays and more searching physical diagnosis have gradually shifted the emphasis from the tuberculous adult to the tubercularized child. It is now generally held by those who have carefully studied the results of our modern research that tuberculosis is largely a childhood infection by direct contact with open cases of tuberculosis. There is no question that tuberculous milk may infect the child but in those countries where special attention is given to the milk supply, and pasteurization or boiling is almost universal, the danger from milk infection is very slight. In England, however, milk infection appears to be quite frequent and in Edinburgh, according to Thomson and other observers there, the principal means of childhood infection.

The incidence of childhood infection in various localities differs considerably, but there is general agreement that congenital tuberculosis is comparatively rare; that infection takes place largely after birth in the home environment during the first year and in the wider social environment after infancy; that there is an increasing proportion of infection with the increase in age of the children until at puberty from 70 to 90 per cent. have received a tuberculous infection. We are all familiar with the classical studies of von Pirquet, Hamburger and A. Ghon. Some of von Pirquet's† early figures are here given to compare with our present ones, as they confirm the soundness of his original investigations. von Pirquet obtained the following results from tests upon 1407 children seen at the Escherich Clinic, Vienna:

* *Ibid.*, p. 153.

† von Pirquet, Clemens, Frequency of Tuberculosis in Childhood, Jour. A. M. A., (Feb. 27, 1909), lii, pp. 675–678.

Table 24

Years	0–1	1–2	2–3	3–4	5–6
Number of all cases	410	116	98	110	91
Reaction positive	21 (5%)	24 (4%)	32 (33%)	42 (38%)	50(55%)
Manifestly tuberculous reacting	21	23	19	23	18
Manifestly tuberculous not reacting (miliary tuberculosis)	1 (5%)	4 (20%)	1 (19%)	3 (21%)	1 (20%)

Positive reaction in 80 per cent. of the cases was reached in the tenth year. von Pirquet remarks that the percentage of reacting children is particularly high in his tables because "tuberculosis is notoriously prevalent in Vienna," especially among the poorer classes. When we compare the results of others with those given above we find that von Pirquet's figures are not so extraordinary after all.

The following table from Fishberg showing the ages of the children and the number and percentage of children giving positive and negative von Pirquet reactions is instructive:

Table 25.—Percentage of Children Reacting to Tuberculin Test (von Pirquet) Administered Once (New York). (After Fishberg)

Age	Number	Positive		Negative	
		Number	Per cent.	Number	Per cent.
Under 6 months	22	1	4.5	21	95.46
6 to 12 months	34	5	14.71	29	85.29
2 years	39	13	33.33	26	66.67
3 years	36	14	38.89	22	61.11
4 years	44	19	43.18	25	56.82
5 years	51	24	47.06	27	52.94
6 years	55	29	52.73	26	47.27
7 years	45	27	60.00	18	40.00
8 years	45	28	62.22	17	37.78
9 years	40	27	67.50	13	32.50
10 years	43	30	69.77	13	30.23
11 years	35	22	62.86	13	37.14
12 years	44	29	65.91	15	34.09
13 years	35	27	77.14	8	22.86
14 years	20	15	75.00	5	25.00
Totals	588	310	52.72	278	47.28

Although the incidence of tuberculous infection in the first year of life is not very high it is sufficiently serious to merit our attention in the prevention of infant mortality. The babies infected early exhibit but little resistance to the disease and most of them perish within the first year from a generalized tuberculosis or tuberculous meningitis. In the year 1919 the death returns in the Registration Area of U. S. gave 0.7 per cent. of the total deaths under one year as due to tuber-

culous meningitis, 0.5 per cent. to tuberculosis of the lungs and 0.2 per cent. as due to other forms of tuberculous. In other words 1.5 per cent. of the total deaths in infancy in the Registration Area were due to tuberculosis, and this may be taken as a conservative estimate as a number of babies reported dying from "convulsions," "malnutrition," "bronchitis," etc., undoubtedly suffered from a "concealed tuberculosis."

We may, therefore, sum up our present knowledge of tuberculosis as it relates to childhood as follows:

1. Tuberculosis is not hereditary in the strict sense of the word.
2. Congenital tuberculosis is rare.
3. Tuberculous infection takes place in the child, the incidence of infection being small the first year and gradually increasing with each year of childhood.
4. Tuberculosis in infancy develops rapidly into an active form, and the mortality during the first year of life is very high.
5. Direct contact with tuberculous adults is the chief mode of infection in infancy, although tuberculous milk may play a part in communities where breast feeding is not prevalent and the general milk supply is not pasteurized or boiled.
6. In the future anti-tuberculosis measures must be directed more to the prevention of infection in childhood, and the building up of the child's resistance.
7. Exposure to minimal doses of tubercle bacilli produces a relative immunity.
8. We still look for a specific immune sera or vaccine which will assist the body in acquiring and preserving its immunity.

The Acute Communicable Diseases.—Although the acute communicable diseases of childhood make up only about 4 per cent. of the total number of deaths under one year they are of sufficient importance to demand careful consideration. Whooping-cough and measles continue to come in recurring epidemic waves and take a heavy toll of infant lives. Very little progress on the whole has been made in the prevention of these two diseases. The complications and sequelæ of both leave a damaged childhood which we try to patch up in later years. To give some idea of the seriousness of the four important contagious diseases of childhood and the period of childhood in which they take their largest toll the diagram showing the experience in Ohio for 10 years is given (Fig. 16).

One of the most instructive studies in this country on the morbidity and mortality of pertussis and measles is that of Veeder.* A painstaking statistical study of measles was also carried out by the late Frederick S. Crum.† Vedder points out that while the death rates for

* Veeder, Borden S., The Morbidity and Mortality of Pertussis and Measles with Particular Reference to Age, Proc. American Assoc. for Study and Prevent. Infant Mortality, 7th Annual Meeting (1916), pp. 86–101. Charts and diagrams.

† Crum, Frederick S., A Statistical Study of Measles, Amer. Jour. Pub. Health, iv, No. 4 (1914), pp. 289–309.

diarrhea and enteritis, tuberculosis, diphtheria and typhoid have decreased in the last 15 years, those for measles and whooping-cough remain practically the same. The number of deaths from each of these diseases each year in the United States is in the neighborhood of 10,000. Of this number about 80 per cent. of the whooping-cough and 50 per cent. of the measles occur in children under two years of age. Crum*

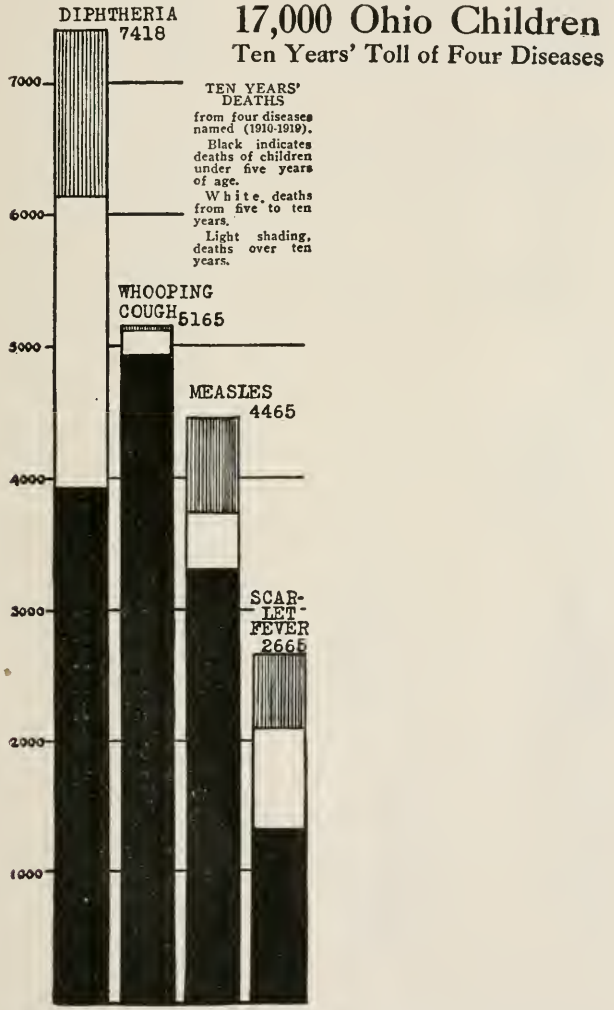


FIG. 16.—Serious loss of life under five years of age from four important diseases. (From The Ohio Public Health Journal, xi, No. 12, Dec., 1920, p. 195.)

estimates that a little over 1 per cent. of all deaths in the temperate zone are due to measles. The charts from Veeder show the distribution by age of the deaths from the four principal communicable diseases of childhood (Figs. 18 and 19).

* *Ibid.*, p. 290.

FIG. 17.—From The American Journal of Public Health, 19, p. 1011.

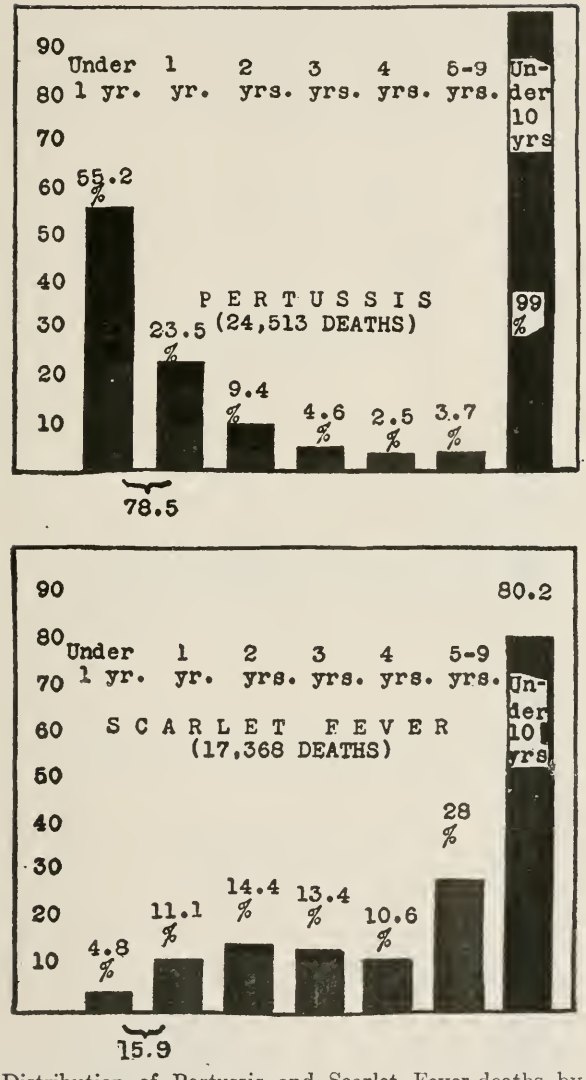


FIG. 18.—Distribution of Pertussis and Scarlet Fever deaths by age. U. S. Registration Area, 1910–13. (From Veeder.)

Whooping-cough is even more fatal for children under one year of age than measles, or any other of the acute communicable diseases. The fatal termination of this disease is usually, as is the case with measles, due to one of its complications, most often of the respiratory tract. The mortality from whooping-cough varies in different cities

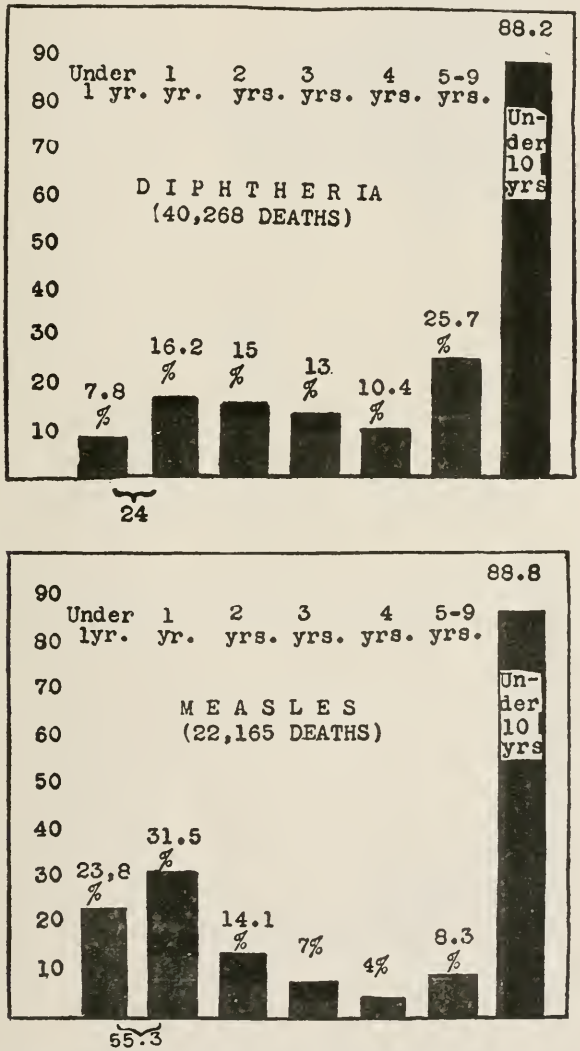


Fig. 19.—Distribution of Diphtheria and Measles deaths by age. U. S. Registration Area, 1910–13. (From Veeder.)

(Fig. 17), as is seen from the chart presented by Crum. The mortality from whooping-cough in the Registration Area of the United States according to age and sex and age distribution of deaths is well brought out in these charts (Fig. 20).

The prevention of both measles and whooping-cough is exceedingly difficult and the same reasons to a large extent apply to each. Abt,*

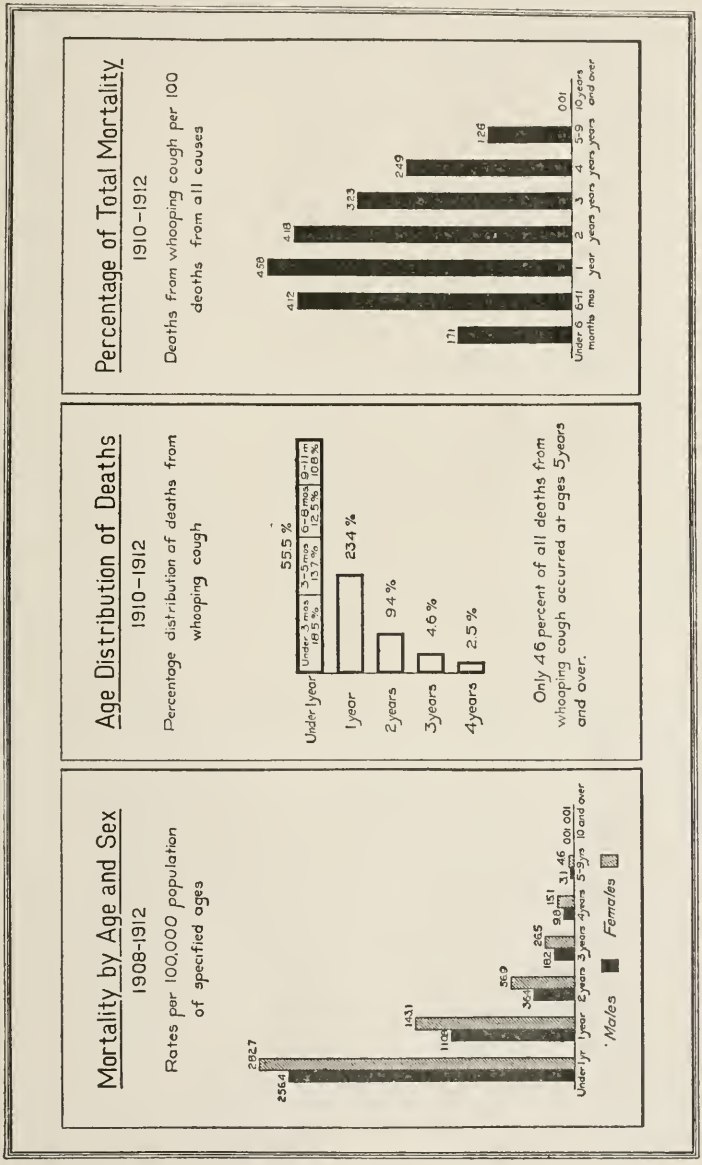


Fig. 20.—From American Journal of Public Health, 19, p. 1007.

in an admirable study of pertussis, has pointed out the difficulties of its prevention under the following heads:

* Abt, Isaac A., Pertussis, Proc. Amer. Assoc. for Study and Prevent. of Infant Mortality, 7th Annual Meeting (1916), p. 134.

"1. The disease is infectious during the early stages.

"2. The disease presents so few symptoms at the onset that the diagnosis can be positively made only after a lapse of considerable time when definite symptoms occur.

"3. On account of the mildness or atypical symptoms the true nature of the disease sometimes remains unrecognized during the entire course.

"4. In spite of an evident diagnosis the children are sometimes sent to school.

"5. Convalescents are sometimes admitted to their classes before the contagiousness of the disease has disappeared."

Our next great advance in the prevention of the contagious diseases of childhood must be the prevention of infant infection from whooping-cough and measles and in the immunization against diphtheria. The respiratory diseases of infancy are so closely related to whooping-cough, measles, and tuberculosis that means taken to prevent these infections will have a marked effect upon deaths from bronchitis and pneumonia. More attention should be given to the "common cold" as a caustive factor in the acute respiratory diseases of infancy. Before much headway in the prevention of these contagious diseases can be brought about a wider educational publicity must be conducted to reach the mothers and fathers in the homes. Without a keen civic conscience regarding the spread of the communicable diseases little can be expected through isolation and quarantine feebly enforced by the health authorities.

Historical Resumé of Child Hygiene.—The historical development of the study and prevention of infant mortality and of child welfare work has been so thoroughly and delightfully treated by Holt in his Address on "Infant Mortality, Ancient and Modern: An Historical Sketch," from which many of the facts used in this summary are drawn, and by Garrison as a part of his chapter on the "History of Pediatrics" in Volume I that it will be necessary here simply to touch briefly some of the outstanding peaks of progress in maternity and child hygiene as it has extended from country to country. For convenience of reference these will be noted chronologically with but a short statement as to their historical and practical importance:

1817. John Bunnell Davis' classical little book entitled, "A Cursory Inquiry into Some of the Principal Causes of Mortality among Children, with a View to Assist in Ameliorating the State of the Rising Generation in Health, Morals and Happiness." London, 1817. This book was strangely modern in stating many of the underlying principles which we stress today. The importance and duty of breast feeding were strongly urged.

1844. First *crèche,* or day-nursery, established in Paris by M. Firmin Marbeau, Mayor of the first arrondissement. This was designed for poor working mothers to leave their infants while they went out to work. It was presided over by a nun, and a visiting

physician called daily. From 1844 to 1847 nine more crèches were established in Paris.

1847. Société des Crèches formed in Paris to bring about better coöperation and standardize methods. By this time the idea of the crèche was taking hold on other parts of Europe and the number of crèches established in other countries increased rapidly.

1861. Infant Mortality recognized as a social problem at the meeting of the National Society for the Promotion of Social Science held at Dublin. Sir William Moore delivered an address on "Some of the More Prominent Causes of Excessive Infant Mortality" in which he pointed out clearly the socio-economic factors.

1865. Société Protectrice de l'Enfance organized in France to encourage breast feeding; supervise babies placed out to wet-nurse and instruct mothers in child hygiene. After 10 years of successful work the Society was able to show good results in the reduction of infant mortality in the district it touched.

1865. Dr. Wm. Farr considered "Infant Mortality" in his Annual Report of the Registrar-General of England and Wales.

1871. Infant Mortality discussed at a meeting of the Social Science Association in Philadelphia. An Address by John S. Parry on "Infant Mortality and Necessity of a Foundling Hospital in Philadelphia."

1872. Life Protection Act in England designed to protect "farmed-out" babies by requiring registration and licensing of all boarding homes for infants.

1873. New York Diet Kitchen Association formed and a milk station established.

1874. *Loi Protectrice des Enfants*, better known as the Roussel Law, was passed in France to ensure supervision of children under two years of age placed out to nurse, and of the boarding homes where they were placed. Registration, licensing and inspection of all places, where babies were boarded out away from their parents, were provided for in this law.

1876. *Société d'Allaitement Maternelle*, a Society for nursing mothers, was organized in Paris primarily for the encouragement of breast feeding. It aimed to encourage maternal nursing by providing for both the expectant and nursing mother. It sent friendly visitors into the homes to assist mothers during the prenatal period and after confinement, and offered facilities for the mothers to consult a physician from time to time during pregnancy. Prematernity homes were established. Maternity grants were allowed. Regular monthly observations of the infants by physicians and home visitors were provided. During 16 years the Society cared for about 10,000 mothers in prematernity homes with excellent results. The prenatal service showed marked results in the reduction of maternal and neonatal mortality. It is reported that there were no deaths of the mothers who were received into the maternity hospitals from the prematernity homes. Pinard claimed that the babies were in better condition and weighed more than others not thus cared for.

1876. Infant Mortality considered at the First International Congress of Hygiene in Brussels. Mortalité des Enfants Nouveau-Nés, Congrès International d'Hygiène, Vol. 1, Brussels, 1876.

1877. First law prohibiting pregnant women from working in factories a certain number of weeks before and after confinement was passed in Switzerland. Similar laws were passed in Hungary (1884), Austria (1885), Holland (1889), Belgium (1889), England (1891), Germany (1891).

1878. Second Meeting of the International Congress of Hygiene in Paris. At this meeting a committee consisting of Bertillon, Marjolin and Bergeron gave a comprehensive report on the causes, extent and prevention of infant mortality.

1890. First simple consultation for nurslings opened by Professor Herrgott at Nancy, France. This was called "L'Oeuvre de la Maternite."* Infants born at the Maternity Hospital were required to be brought back one month after birth for a complete medical examination, and if found in good condition and gaining favorably the mothers were given a money subsidy. During the years 1890–1900, 2,052 women were cared for in that institution and 25,382 francs were distributed. The results proved uniformly good.

1892. First fully developed "Consultation de Nourisson" opened in June by Dr. Pierre Budin in connection with the Charité at Paris. Its prime object was the supervision and hygienic direction of infants born at the Maternity Hospital. Great stress was laid upon the establishment and continuance of breast feeding. Regular medical supervision was kept up for one or two years with frequent visits of the mothers with their babies to the "Consultation."

1892. In July Dr. Henri Variot established in Paris a milk station in connection with the Belleville Dispensary, called "Distributation de Lait au Dispensaire de Belleville." This has also been called by some "L'Oeuvre de la Goutte de Lait" and said to be the first "Goutte de Lait," but generally the first "Goutte de Lait" is attributed to Dr. Dufour of Féchamp.

1893. Nathan Straus Infant Milk Depots established in New York City where pasteurized milk modified according to certain fixed formulæ was dispensed from six milk depots at a reduced cost.† Over 2,300 babies were fed on the Straus modified and pasteurized milk daily during the first year and between 4,000 and 5,000 babies were benefited during that year.†

1894. The first "Goutte de Lait" as a separate institution, outside the metropolis, was established by Dr. Leon Dufour in the small Norman town of Féchamp, and he was the first to give the name "Goutte de Lait" to these "milk stations." As stated by Dufour the objects of the "Goutte de Lait" were:

*See: Herrgott, Annales de la Société Obstétricale de France, 1901.

†Straus, Lina Gutherz, "Disease in Milk—The Remedy Pasteurization." The Life and Work of Nathan Straus (1917), pp. 75 ff., E. P. Dutton and Co., New York.

"1. To induce mothers by advice and by every possible encouragement to feed their babies at the breast.

"2. When it is impossible for the child to be wholly breast-fed, the mother is urged not to abandon breast feeding altogether, but to supplement her own milk with suitably prepared cow's milk, so as to secure that the infant shall be, if not wholly, at least partially breast-fed.

"3. When, however, there is no doubt that it is impossible, physically, socially, or morally, for the mother to suckle her baby, the Goutte de Lait endeavors to secure that the infant shall not lack maternal care and affection. For this purpose there is given under the best possible conditions a milk of good quality, with advice as to the conditions necessary for success in artificial feeding."*

These local "milk depots" for combating infant mortality were models for others established throughout continental Europe and England and transplanted, with certain modifications, to America where they later developed into our infant welfare centers.

1894–1903. Villiers de Duc Demonstration in France. Mayor Morel, basing the demonstration upon the experience of his father in the same village 1854–1863, devised a simple but effective scheme for the saving of infant life and enforced it through his office as Mayor. Every pregnancy was reported early. Breast-feeding was encouraged for every baby. Every case of illness in a mother or child was reported within 24 hours and medical help was made available. Regular consultations were held, and a good milk supply assured those who could not nurse their babies. This program was carried out for 10 years with signal success, as it is reported that not a single mother or baby died in the village during that time.†

1895. Consultation de Nourrissons established by Budin at Maternité Hospital in Paris.

1896. National Congress for Infancy at Florence, Italy.

1897. Milk Station established at Rochester, New York.

1897. First Belgian "Goutte de Lait" established in Brussels by Dr. Eugene Lust. Called a "Laiterie Maternelle."

1899. Committee of the St. Helen's Town Council, England, sent to Féchamp to study the "Goutte de Lait" of Dr. Dufour. Following their report the first "Goutte de Lait" was opened in England at St. Helens. In its English environment it was known as a "municipal milk depot," and differed somewhat from its French model, although carrying out the original intent of supervision of infant hygiene and feeding. This was followed by the establishment of Milk Depots in

* Quoted by McCleary, G. F., "Infant Mortality and Infant Milk Depots" (1905), pp. 61–62. Ref. to brochure by Dr. Leon Dufour, "Comment on crée une Goutte de Lait."

† Knox, J. H. Mason, Jr., "The Next Step in a Health Program," Mother and Child, ii, No. 9 (Sept., 1921), p. 409. See also Broadbent, Benjamin, "An Open Letter to the Mothers of Huddersfield," Daily Chronicle Printing Works, Lord Street, Huddersfield, 1911.

Liverpool (1901), Battersea (1902), Leith and Bradford (1903) and Burnley, Glasgow and Dundee (1904). The Milk Depot in England gradually broadened its functions to assume more and more medical supervision of infant hygiene with the addition of health visitors to follow-up with advice and instruction in the homes.

1899. Milk Station established at the Babies' Hospital in Newark, New Jersey, by Dr. Henry L. Coit, the "father of the Certified Milk Idea."

1901. Brooklyn Children's Aid Society established eleven Milk Stations.

1902. Midwives' Act passed in England and a Central Midwives' Board was created whose duty it was to make rules and regulations relating to midwives.

1903. Milk Stations of the Babies' Milk Fund Association of Baltimore were opened.

1905. New York Association for Improving the Condition of the Poor carried on a vigorous campaign for better milk which resulted the following year in the organization of the New York Milk Committee.

1905. *Cantines maternelles* (mothers' canteens) established in Paris for expectant and nursing mothers.

1906. The New York Milk Committee created. This was a powerful factor in stimulating better milk supply, infant welfare work, better statistics on Infant Mortality, etc.

1906. Babies' Dispensary and Hospital of Cleveland, Ohio, began its work with a clearly defined plan and a scheme for city wide infant welfare work. Its underlying principles were similar to those of the Saugslingsfüersorgestellen of Berlin. Practically all the municipal infant welfare of Cleveland had as its mainspring the work of the Babies' Dispensary and Hospital. As soon as a piece of infant welfare work had been thoroughly demonstrated and worked out it was linked up to the City Bureau of Child Hygiene or other municipal activities. It has also been instrumental in carrying out a consistent plan for the education of medical students and nurses in child hygiene work.

1906. St. Louis, Missouri, Milk Commission opened in July a milk station which bore the name of *"Goutte de Lait,"* the first with this name in the United States, and patterned after the French institutions of the same name.*

1906. In Huddersfield, England, with Benjamin Broadbent as Mayor the notification of births within 36 hours was made compulsory. This was an important step in the child welfare program as it made possible the early care of mothers and infants under the supervision of the health authorities.

The application of the notification of births to infant welfare proved so beneficial that Mr. Broadbent gave his influence to the passage of the Notification of Births Act which passed Parliament the following

* Bleyer, Adrien, "An Infant Welfare Station in St. Louis in 1906," Jour. of the Missouri State Medical Association, xviii, No. 2 (Feb., 1921, pp. 51–52).

year. By means of well planned child hygiene based upon the methods used at Villers de Duc Mayor Broadbent succeeded in reducing the infant mortality of Huddersfield from 139 to 44 per thousand births.*

1906. First Extensive Exhibition for Infant Welfare in Germany held at Berlin in March, in which the Government and local health authorities took great interest.

1907. England passed the Notification of Births Act.

1907. New York Association for Improving the Condition of the Poor began prenatal work.

1908. New York City Bureau of Child Hygiene, the first in the United States, was organized under Dr. S. Josephine Baker as Director. The Bureau has continued to the present under the same Director and has been a pioneer in many lines of child hygiene in this country.

1909. In June the "Kaiserin Auguste Victoria-Haus" was opened at Charlottenburg for the prevention of infant mortality in Germany. This institution was designed to combine scientific research and practical application of measures for the welfare of infants. Its objects were stated to be:

"1. To investigate scientifically and practically by means of suitable arrangements the questions concerning the nourishing and bringing up of infants and the care of mothers.

"2. To collect material concerning infant mortality and regarding the existing arrangements and organizations for the care of infants and mothers in Germany and foreign civilized countries.

"3. To make generally known in a suitable manner by publications the results of such scientific and practical investigations as well as to publish the material collected in the field of infant and mother welfare work. Further, to give information and advice to official bodies, public and private associations and private individuals."†

1909. "Deutsche Vereinigung für Saügslingsschutz" formed in Berlin to organize the scientific and practical work for the welfare of infants being done in Germany.

1909. Organization of the American Association for the Study and Prevention of Infant Mortality (now the American Child Hygiene Association) at New Haven, Conn. The Annual Transactions of this Association are invaluable handbooks on the progress of child hygiene. Its monthly magazine, "Mother and Child," gives current news items and articles on modern developments of maternity and child welfare. The Association is actively engaged in maternal, infant and child hygiene work. About 375 local organizations are affiliated with the Association and its total membership is about 2,400.

1911. New York Milk Committee began an experiment in prenatal care by employing nurses to educate expectant mothers. This work

*Broadbent, Benjamin, "An Open Letter to the Mothers of Huddersfield." Also "Benjamin Broadbent, the Babies' Mayor," Mother and Child, ii, No. 7 (July, 1921) pp. 298–306.

†Report, III Internationaler Kongress für Säugslingsschutz, 1911 (Gouttes de Lait), Saugslingfürsorge in gross-Berlin, verlag von Georg Stilke, Berlin (1911), pp. 351 ff.

was turned over to the Bureau of Child Hygiene in 1914 and eight nurses giving all-year round prenatal service were appointed.

1912. Children's Bureau of the United States Department of Labor created and Miss Julia Lathrop appointed its Chief. This Bureau, under the same Chief, has rendered excellent service to the cause of maternity and child welfare. Its studies on Infant Mortality in typical American communities should be consulted by all interested in this subject. A wealth of information is incorporated in its reports and studies issued from time to time. It centered attention upon the child during the War in the Children's Year Campaign which stimulated local efforts for child welfare all over the country, resulting in the formation of many State and municipal Bureaus of Child Hygiene. The post-war conferences on child welfare, out of which grew the Minimum Standards for Child Welfare, were arranged and carried out by the Children's Bureau.

1914. Complete scheme for Maternity and Child Welfare for England and Wales outlined by Sir Arthur Newsholme, then Chief Medical Officer of the Local Government Board. "To encourage the adoption of schemes by local authorities, the Local Government Board of England and Wales was at that time prepared to pay grants in aid of approved local expenditures, whether by local authorities or voluntary organizations, for the salaries of health visitors or other officers engaged in child-welfare work, and for clinics, dispensaries or other institutions providing medical and surgical advice and treatment to mothers, and children up to the age of five years."* The Parliamentary grants were greatly extended during and since the War and have been the main incentive to the rapid development of child-welfare work in England and Wales and also in Scotland and Ireland.

1915. The Notification of Births (Extension) Act passed in England.

1920. Formation of the National Child Health Council in the United States. A council to assist in the coördination of child health activities.

1921. July. The Sheppard-Towner Bill for the "Public Protection of Maternity and Infancy" passed the U. S. Senate and in November passed the House and was signed by the President.

1921. Beginning of the National Child Health Demonstration at Mansfield, Ohio.

Attention Now Focused on Child Welfare.—It is no longer necessary to urge among our intelligent communities the vital need for well planned child welfare work. The World War forced upon us a consideration for our mothers and children which the slower forces of social evolution may have taken decades to do. The telling campaign of education carried on during the Children's Year by the Children's Bureau stimulated child welfare endeavors in many directions. The

* "Infant Welfare Work in Europe," by Nettie McGill, Community Child-welfare Series No. 1, Bureau Pub. No. 76, p. 21. Children's Bureau, U. S. Department of Labor, Washingtion, D. C., 1921.

post-war conferences planned by the same Bureau resulted in setting up certain minimum standards of Child Welfare. The experience of the war torn countries, notably of England, has turned our attention to practical solutions for our problems of infant and child mortality.

Contribution of Our Universities.—Our Universities and Colleges for some time have attacked the problems of infancy and childhood from an academic standpoint, and have laid down certain fundamental guiding principles in child study; in psychology, in economics and in dietetics. The application of these principles has fallen largely to educated mothers, teachers, social workers and socio-medical pioneers. The questions involved are no longer of purely academic interest as to *what* we shall do for the children of our generation, but are of more immediate practical import as to *how* we shall marshal our medical and social forces to guarantee a future generation able to resist the disintegrating forces and to conserve elements of strength for the reconstruction period.

Practical Activities Stimulated by Universities.—The practical interest which our universities have developed in child welfare has grown out of a consciousness that mere academic regard for the underlying principles is productive of little enthusiasm in the student unless he comes into direct contact with the living problems. The paths to the larger interests in the problems of infant and child life were blazed by the patient, and ofttimes unappreciated, efforts of our University professors who have seen the wider social horizon. The first objective responses to their inspiration were met in university settlements; in experimental child study schools; in kindergartens and in juvenile courts. The milk stations and infant welfare centers were of somewhat later growth, but their function was immediately recognized as an important one in the great campaign against infant mortality. The study of tuberculosis in its various aspects had brought home to us that there were other than strictly medical phases in the problem of disease. Diseases such as tuberculosis and syphilis came to be regarded as largely social, to be met by social readjustments as well as by clinical medicine. To meet the pressing needs of the enlarging dispensary problem, social service departments connected with hospitals arose.

Responsibility of the Medical School.*—The modern Medical School has had its share in the shaping of our ideas regarding the social as well as the medical treatment of children. This is aptly illustrated in the development of the Pediatric Department, as differentiated from General Medicine, in some of the leading institutions. In these places the pediatric department has often been the pioneer in socio-medical work. Lucas in writing upon the subject of the socio-medical development in our medical schools has said that: "This growth has

* Considerable material in the following sections has been derived from a "Thesis: The Problems Presented to a Children's Department of a University Hospital in Meeting the Medical-social Needs of a Cosmopolitan City," by Richard A. Bolt, presented to the University of California, May, 1917.

been rapid and gratifying to all those who have had an opportunity to follow the development in its entirety, and such growth should set the standard for the development of the other legitimate fields in pediatrics, for it is only by the unification of laboratory, hospital and social factors that any of the problems of child welfare can be worked out satisfactorily. The medical schools, even in this field, have differed in the emphasis put on these three lines of development. In some schools the purely teaching phase has predominated, while others have dwelt largely on research work in infant metabolism, and again, the social work has lagged far behind. But from the field of pediatrics as a whole, certain high standards have emerged along all lines, and not the least of these is the child welfare social work as it is being carried on by the New York Milk Committee and by the pediatric departments of Harvard and Western Reserve Universities."*

Social Pediatrics.—Since this was written considerable advance has been made in a number of our medical schools in providing certain work in "social pediatrics." The American Pediatric Society has taken cognizance of this work and has provided as a part of its annual program a section on "Child Welfare." A Committee appointed by this Society also drew up an outline of what it considered desirable in the teaching of medical students in Child Hygiene. Dr. Henry L. K. Shaw has presented a very helpful syllabus of a course of instruction in social medicine which is being carried out at Albany Medical College.† If the medical man of the future is to solve intelligently the problems connected with infant mortality he must, it would seem, receive thorough instruction in the fundamentals of child welfare during his medical course. The following seem essential in infant and child welfare work:

An Ideal Scheme for a Social Pediatric Course.‡—1. A thorough course in pediatrics, laying stress on the fundamentals of infant hygiene and infant feeding.

2. Thorough instruction in modern pediatric methods with actual experience in a babies' dispensary for sick children and an infant welfare center for well ones.

3. A good working knowledge of obstetrics, especially in its relation to the nursing and social needs of the community.

4. Experience in a maternity and prenatal service.

5. A knowledge of the important causes of infant mortality and the most approved methods for its prevention.

6. Familiarity with the general methods of all social agencies working in the community.

* Lucas, William Palmer, Some Further Developments in a Pediatric Department of a University Medical School, Jour. A. M. A., lxvi (April 8, 1916), p. 1075.

† Shaw, H. L. K., Social Pediatrics, Jour. A. M. A., lxxiv (May 1, 1920), pp. 1275–76.

‡Bolt, Richard A., The Education of the Medical Student in His Relation to Child Welfare. Reprint from "Canadian Medical Week" (1917).

Coördination Needed.—There is another very important phase of the child welfare program. Parallel with the work in our universities and colleges to solve the child hygiene problems, a considerable amount of extra mural effort has been expended by philanthropic individuals and social organizations. Their humanitarian impulses to "help the babies" were at first largely sentimental, and simply offered immediate and temporary balm for the crying needs of the child. Charitable effort was directed to "saving the child." The complex causes of infant mortality were at first dimly glimpsed. The intricate problems of infant mortality, of social and economic maladjustments, of mental deficiencies slowly came into view. Practical workers in the social field who came hard up against the every-day problems of childhood were eventually brought face to face with buoyant, enthusiastic students fresh from the sociology and economic classes who were anxious to try out the social and economic theories imbibed there. This give and take produced more hopeful, resourceful workers. It further stimulated the universities to provide facilities for first hand training of its students along socio-medical lines. This is distinctly reflected, during the past decade, in the active growth of child welfare in coöperation with the various medical and social agencies of our cosmopolitan centers.

Relation of Private Initiative to Public Health Work.—While pioneer work in child welfare has been done almost entirely by private agencies or individuals—or at most by those of a semi-private nature financed by private subscription—it did not take long for the public to realize that much of the work done by child welfare organizations was really public health work. Little by little certain parts of the child welfare program have been taken over by the municipal health departments in our more progressive cities. The logical outcome is to have this public health work for children taken over and directed by the health authorities of the community. Thus far comparatively few health departments are in a position to carry on successfully such work. Too often the departments are hampered by politics and poorly paid officials. The budgets for most health departments are woefully inadequate to meet the needs, and the money allotted for child welfare is infinitesimal compared to that devoted to other municipal purposes. The voluntary, private organizations must for some time back up the work attempted by the local health officials, and give a stimulus to it.

Growth of State and City Bureaus of Child Hygiene.*— A development of considerable promise has been the organization of a large number of State Bureaus of Child Hygiene. Child hygiene being a very important part of general health should receive adequate recognition and support from the State authorities. The first State Child Hygiene Division was established in Louisiana in 1912, although it should be borne in mind that several cities had established Bureaus of

* Rude, Anna E., Status of State Bureaus of Child Hygiene, American Journal of Public Health (Oct., 1920), 10, pp. 772–779.

Child Hygiene prior to that time. New York City established its Bureau in 1908. In the early years the growth of divisions of child hygiene in state health departments was very slow, only eight being established in the years 1912–1917. In the period 1918–1920, due to the stimulus of the War and the nation wide interest aroused by the Children's Year, 23 state divisions or bureaus of child hygiene were set up. Since then five more have been established, making a grand total of 36 states now organized to carry on child hygiene. Besides the organization of bureaus of child hygiene, a considerable amount of study has been put upon child welfare problems in the various states by so called Children's Code Commissions,* appointed in most instances by the Governors to study the conditions and make recommendations as to necessary legislation. While it is true that the greater part of the work of these Commissions concerned itself with dependent, delinquent and defective children and institutional care, some of the states have had a careful survey made of the health conditions. The National Child Health Council recognizing the importance of the work of these Commissions appointed an advisory committee to study the work of the Child Welfare Commissions and suggest minimum requirements. A great deal remains to be done in bringing the child welfare work into conformity with what we now know to be suitable standards. A large number of national organizations are attempting to carry on educational publicity along various lines of child welfare and are stimulating local efforts to meet the problems.†

Universities Must Provide for Training in Child Welfare.—With all this broad development of child welfare the University must reckon. The training necessary to equip physicians, nurses and directors for child hygiene bureaus is properly the function of the University. The Medical School through its Department of Pediatrics should be alive to the responsibilities involved in the training of socially minded men and women. Nowhere has the social change in medicine been more marked than in the pediatric departments of our large university medical schools. In sketching an ideal scheme for future public health work, bearing in mind especially the child hygiene side, Gerstenberger, one of the pioneers in this field, says that one of its fundamental characteristics would be "the supervision and constant education of this physician (the properly trained and supervised district physician) by the heads of the various university departments in medicine, sociology and nursing, or by members of their staffs appointed by them. I choose the University as the guiding and supervising institution for two reasons:

"1. Because with our present ever-changing form of government, the University is the only place where we can hope for stability, conservatism, permanency and ideals. This does not mean, of course,

* State Commissions for the Study and Revision of Child Welfare Laws, Children's Bureau, U. S. Department of Labor, Publication No. 71 (1921).

† See Digest of Programs of National Organizations Carrying on Some Phase of Child Welfare. Published by the American Child Hygiene Association, 1921.

that stability, conservatism, permanency and ideals are always found at the University, but in our country they are most likely and most frequently to be found there rather than anywhere else.

"2. Because the University in order to best train men and women for such work needs direct access to the practical public health work."*

A Modern Pediatric Department.—The function of a modern pediatric department of a university medical school is, therefore, no longer merely to instruct how to examine and prescribe for sick babies, nor to utilize these as so much "clinical material" for the instruction of medical students. The use of the babies for instructive purposes must of course not be overlooked, but it involves a wider social significance than formerly believed. The educational program must take into consideration the well baby, its mother, the home and its social and economic circumstances. These will throw valuable side-lights on the strictly medical problems and greatly assist in successfully carrying out their solution. The relation of pediatrics to public health will inevitably receive more attention. "Public Health work for children," said Dr. S. Josephine Baker, "has steadily and progressively deviated from our preconceived ideas of the relation of health boards to the community. It is an expression of the social conscience of the people together with an enlightened desire on the part of the health authorities to direct and educate rather than to correct and punish."

Local Responsibility for Infant Welfare.—Two decades of education and patient endeavor on the part of voluntary organizations and philanthropic individuals, with a wealth of experience in the various phases of infant welfare work, have thoroughly demonstrated that the local community is largely responsible for the protection and conservation of its child life. It is now generally admitted that the city or town not only has the right to throw about motherhood and childhood every possible safeguard, but that it has become its sacred duty to do so. The Nation itself has at last awakened to its responsibility and after prolonged hearings before Senate and House Committees and consideration before both branches of Congress a Bill for the "Public Protection of Maternity and Infancy" has finally passed Congress. This Bill "was built upon the general plan of aid from the National Government to the States for the purpose of stimulating the States to greater activity in these regards and for the purpose as well of aiding them by contributions from the General Government."†

Tangible Results.—The value of consultations for nurslings, milk stations and infant welfare centers, first demonstrated in France, England and Germany, has also been amply shown in the United

* Gerstenberger, H. J., The Question of Smaller Nursing Districts for All Kinds of Public Health Work versus Larger Districts for Specialized Work, Proc. Amer. Assoc. for Study and Prevent. Inf. Mort. (1915), p 331.

† Towner, Horace M., Statement before the Committee on Interstate and Foreign Commerce of the House of Representatives at Hearings on the Sheppard-Towner Bill for the Public Protection of Maternity and Infancy, Washington, D. C. (Dec. 20, 1920).

States. They were the forerunners in the great campaign against infant mortality in its broadest sense. A study of the infant mortality rates in those cities and towns where intensive infant hygiene work has been carried on reveals a progressively declining rate during the past decade. In those places where painstaking records have been kept a comparison of the general infant mortality rate with that of babies coming directly under the supervision of welfare centers shows that clean, pasteurized milk, expert directions as to feeding and hygiene and follow-up in the homes by trained nurses have had a decided effect in reducing the mortalities of infancy. A similar result has followed in lessened maternal and neonatal mortality where well conceived prenatal work has been carried out.

Better Birth Registration Needed.—Although it is quite impossible in many places, on account of deficiency in birth registration, to state exactly what the reduction has been, it is safe to say that it has been quite substantial. The reduction in the actual number of deaths of infants, despite the great increase in population and number of births, shows that our contention is sound. If we had complete birth registration in this country it would be immediately reflected in the infant mortality rates, and we would be able to know the exact trend of infant mortality and measure the results of our efforts. This desideratum can only be obtained by encouraging a keener civic conscience on the part of physicians and midwives, stimulated by an informed public opinion, and enforced by a fearless wielding of the big stick on the part of the State and municipal authorities.

Development of Infant Welfare Centers.*—While "milk stations" and "consultations" blazed the trail to better efforts, we must now look upon them as simply steps in the gradual evolution of infant welfare centers, known variously as "Baby Health Conferences," "Infant Welfare Stations," "Prophylactic Dispensaries" (Cleveland), etc. The fundamental principles, which were laid down early guiding all these endeavors have remained the same, namely, getting the mother to bring the baby to the consultation as early as possible; the encouragement of breast feeding; thorough physical examination and periodic weighing of the baby; prescription for modification of milk in those cases unable to breast feed; general hygienic directions; follow-up and instruction by nurses in the homes. While, as is said, these have remained practically the same our field of public health service has greatly broadened and we have been led step by step to integrate the infant welfare work of the community with the enlarged public health work.

Infant Welfare Center as Part of Health Center.—To meet the insistent needs of a city-wide public health service for the children—especially for those of tender years—it seems best to group our work

* See Bolt, Richard A., The Development of Infant Welfare Centers, The Cleveland Medical Journal, xvi (Feb., 1918), p. 69. Also Gibbon, I. G., Infant Welfare Centers, The National League for Physical Education and Improvement, Tavistock Square, W. C. London (1913).

into so-called infant welfare centers as integral parts of health centers, to become completely coördinated with all the public health activities of a health district. This, of course, still leaves ample room for voluntary efforts in supplementing the work of the official agencies and in carrying forward new developments and experimental work.

Infant Welfare Center a Health Educational Center.—We must, henceforth, regard the Infant Welfare Center as the health educational center of the district in all that pertains to the welfare of the child. Here not only the mothers with their babies will meet the regular physician and nurses in attendance, but groups of medical students and pupil nurses will gather for instruction in the best methods of infant hygiene. We may also expect the extension of this work in post-graduate courses for physicians in the neighboring towns who care to brace up upon their infant feeding and methods of infant care. To this center the private physicians of the district may confidently come for the closest possible coöperation. They should be made to feel that here exists an opportunity for friendly consultation and study of the most approved methods of normal infant feeding. Much of the routine and detail work for well babies which a busy general practitioner does not care to carry out in his own office may be done in the center if he so desires. The "charity cases" may readily be taken off his hands. A cordial understanding between the private physician and the public health nurses in his district will do much to make his practice more effective.

Primary Function of Infant Welfare Center.—The infant welfare center should provide for the education of the mothers in the care, feeding and general hygiene of all normal infants irrespective of condition at birth or economic circumstances of parents. This is as much a part of the public function as public baths, public playgrounds, libraries or schools. It is often found that the "well-to-do and ignorant" are as much in need of instruction regarding the proper care of babies as the "poor but respectable." Instruction by properly trained and qualified public health nurses in the homes of the babies has been proved to be one of the most important, if not the most important, factor in keeping the babies well and in getting the mothers to take the baby to a physician or dispensary when the first signs of illness arise. Careful follow-up of all infants coming to an infant welfare center is absolutely essential to secure satisfactory results.

A Diagnostic Center.—Where the infant welfare center is a definite part of a district health center it is well to consider the advisability of utilizing it as a diagnostic clinic, as well as a clearing house for all normal well babies. This advance would afford the private physicians in the district an opportunity to avail themselves of expert diagnosis, fortified by laboratory tests, in all cases where it is difficult to carry out all the details in their own offices, or where the economic circumstances of the patients will not justify the extra time of a busy practitioner. While this extension of service would necessitate very careful adjustment in regard to private physicians, and a full understanding

of just what the center may be expected to do, it is felt that the community, and reflexly the physician, will eventually be benefited.

The Normal Baby.—We should never lose sight of the fact that all infant welfare centers are primarily intended for the normal, well babies so that the mothers may receive proper instruction and advice in infant hygiene and that the course of development of the baby may be readily followed. This, of course, presupposes that the physicians and nurses in the centers are thoroughly familiar with what constitutes a normal baby, an expectation which is not always borne out in practice. Slight departures from the normal and mild gastro-intestinal disorders are often overlooked by the parents or glossed over by their family physician. In commenting upon this matter Grulee says: "The tendency to disregard slight gastro-intestinal symptoms is so widespread that one feels helpless in endeavoring to caution even the profession in this regard, but the recognition and proper treatment of slight gastro-intestinal disturbance is of much more importance than the ability to treat more severe conditions when they arise."*

Early Care.—These considerations have forced us to the conclusion that it is perfectly right and proper to encourage the mothers of all infants to bring them as early as possible to one of the infant welfare centers for a thorough preliminary examination and careful instructions in normal feeding, impressing the necessity of breast feeding and the hygiene of infancy. In England by means of the Notification of Births Act it has been possible for the Health Visitors to get into touch with the babies very early and thus give valuable advice to the mothers before they were able to get out to the centers. This advice is especially valuable in regard to the technique of breast feeding and simple hygiene of early infancy. Where the cases are in good financial circumstances and in the hands of capable physicians, a first call is sometimes all that is needed, and the mother is urged to consult her physician from time to time. It should be distinctly understood, and this must be made very plain to the mothers, that if the parents can afford a private physician the baby will be immediately referred out to him should any abnormality develop or should it become acutely ill. If parents cannot afford a private physician, and this will often have to be determined by a searching social investigation, the baby should be referred to a babies' dispensary and hospital or some other suitable institution in the community for sick babies.

Coöperation With Physicians.—The infant welfare centers stand in a position to coöperate with private physicians and render them all possible assistance in the way of sending incipient disorders to them, but have no intention of supplanting the physician in any way in his private work for sick babies. As a matter of fact, in those communities where well coördinated work for child welfare has been carried out the physicians in the community qualified to give an unbiased opinion have stated that such work has made their practice among children

* Grulee, Clifford G., "Infant Feeding," 3d Edit. (1917), p. 67. See Chap. VI, "Attributes of the Normal Child."

more satisfactory. The physicians and nurses connected with infant welfare centers should be especially trained for such work, and should receive compensation for their services, so as to command full respect from their professional associates not employed in such work. The nurses and physicians in the centers should seek to render every possible service consistent with their public responsibilities to physicians in their districts and should fully explain the purposes and methods of their work to the private physician.

The most delicate matter with which workers in infant welfare centers have to deal is in recommending some physician to the mother when she requests it. Many of the mothers going to centers have no regular family physician. In the poorer districts, moving about from place to place is quite common. In this age of wide social contacts no physician can consider that he has a mortgage on the family practice in any community, especially where he is called in but casually and sees the patient but once or twice. We must admit from sad experience that a considerable number of medical men have not had the training nor the experience to fit them to meet the emergencies of the sick infant, especially when it comes to difficult feeding cases. Certainly it is a grave responsibility for us to commit a baby into such hands. We must do either one of two things: Say to the mother that she must choose her own physician without any indication from us as to those of ability and experience in infant feeding, or mention to her a group of reliable medical men in her district whom we know to be competent to handle sick babies and difficult feeding cases. This matter may be worked out practically by bringing it before the local medical society and finding out what men are willing, and have had special training, to take these cases. In the larger centers it will not be difficult to work through a medical society but difficulty may arise in the smaller towns where every doctor on "Main Street" considers himself capable of taking care of any kind of a case. It should be borne in mind that the physicians engaged at the infant welfare centers are usually only on part time. It would be ideal if we could have full-time well trained men for this work, but this is out of the question in most places at present. Only under very exceptional circumstances therefore should any physician working at one of the centers be recommended to the mother in his capacity as a private physician. In the development of infant welfare centers it has been found wise never to *single out* a private physician either to recommend or condemn him. Should the mother give the name of her family physician we are then in a position to get into touch with him and explain to him what the center stands for.

Functions of an Infant Welfare Center.—Summing up the functions of an infant welfare center in a child welfare scheme we may say:

1. It should be open to all mothers and well babies in the district regardless of economic circumstances.

2. A thorough preliminary physical examination of every baby upon its entrance to the center by a well qualified physician.

3. Periodic consultations and weighing of all babies with careful records.

4. Instruction and advice to all mothers in the care, feeding and general hygiene of infancy.

5. Promotion of breast feeding. Where this fails, suitable instructions for the modification of cow's milk.

6. No special milks or formulæ designed for ill babies to be ordered from these centers. All babies needing such milk should be referred to a private physician or a babies' dispensary and hospital for examination and treatment.

7. When a baby under the observation of one of the infant welfare centers develops an abnormal condition or an acute illness, and its parents are in good economic circumstances, it should be referred immediately to a private physician. If unable to afford a private physician, it should be referred to a babies' dispensary and hospital or other institution where it can be suitably looked after. The nurse from the center should get in touch with the private physician or institution and give a history of the case to them.

In the more highly developed centers connected with dispensaries and hospitals the following may also be provided:

1. Smallpox vaccination for all babies whose parents cannot afford a private physician.

2. Securing of blood for Wassermann reactions in all babies sent to boarding homes, or for adoption, and for others where a diagnosis of syphilis is desirable.

3. von Pirquet test on babies from tuberculous homes and in others suspected of tuberculosis.

4. Schick test for babies exposed to diphtheria, where the question of administering immunizing doses of toxin-antitoxin comes up. The ideal method would be to immunize all children between the ages of six months and six years.

5. Taking of nose and throat cultures from all suspicious cases.

6. Taking of smears from inflamed eyes showing secretion.

7. Taking of vaginal smears in all babies sent to boarding homes or to a hospital or out-door ward.

Materials for this diagnostic work should be furnished by the local Department of Health, and the examination of the blood, smears, etc., carried out in the Department Laboratories free of charge to the physicians sending in cases or to the parents who bring the babies.

Future Developments of Infant Welfare Work.—We may reasonably expect that future developments in the saving of infant lives and promoting their welfare will be along the following lines:

1. The recognition of infant welfare work as an integral part of a full rounded maternity and child hygiene program.

2. Better training of physicians, nurses and social workers in socio-medical work for infants and older children.

3. The organization of community forces to cope with the untoward conditions which contribute to infant morbidity and mortality.

4. The prevention of prenatal and neonatal mortality by adequate prenatal care, more skilled obstetrics and better service in maternity hospitals and convalescent homes for mothers.

5. The registration and strict supervision of *all* midwives.

6. The pasteurization or sterilization of *all* milk given to babies.

7. Widespread revival of interest in breast feeding and its promotion.

8. Prevention of whooping-cough and measles in infancy.

9. After six months of age, the immunization against diphtheria by use of toxin-antitoxin.

10. A revival of the practice of vaccination against smallpox for *all* infants.

11. An extension to the rural districts of the lessons learned in the cities.

12. The better organization of state and municipal bureaus of child hygiene to carry on a widespread popular education regarding infant care.

13. Larger interest of the Federal Government in stimulating local endeavors by the granting of State subsidies.

When all these measures are under way we may well expect an infant mortality rate of less than 50 throughout the country and a more healthy and resistant childhood at all ages above one year.

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